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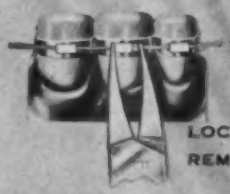

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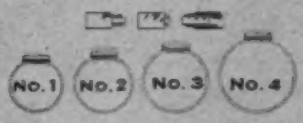

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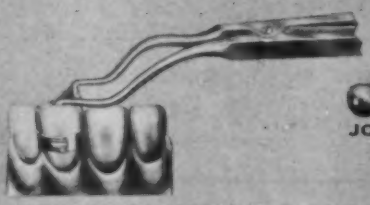

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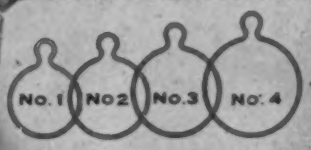

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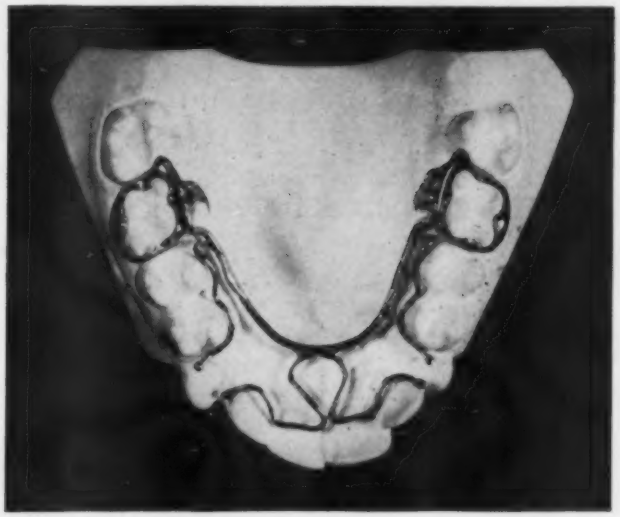

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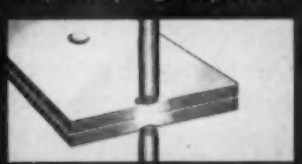

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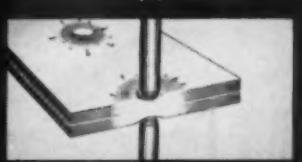

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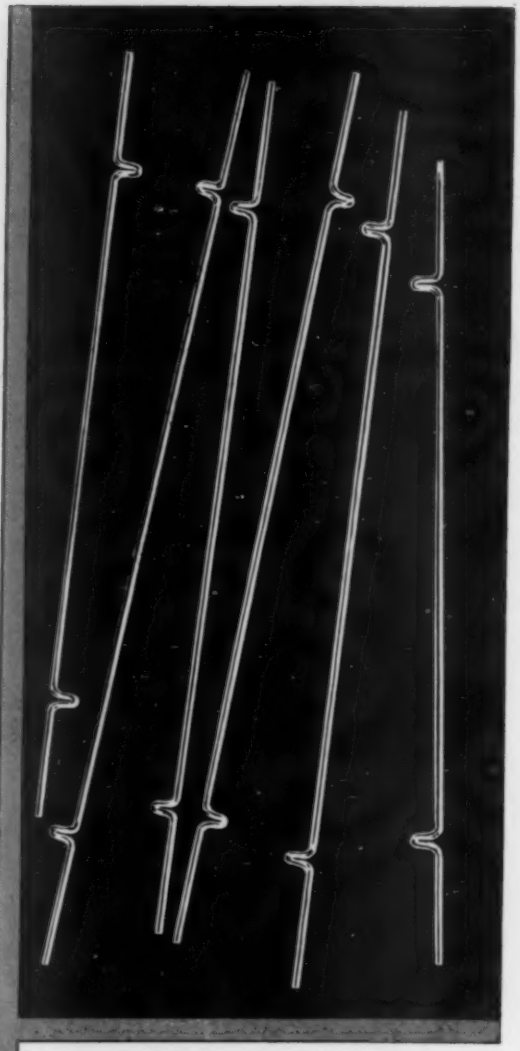

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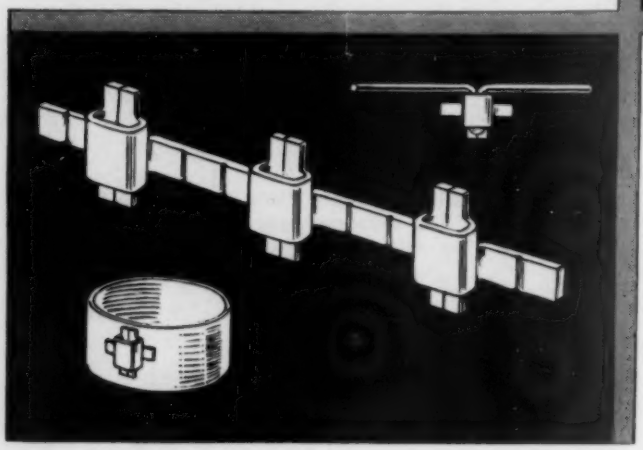

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VOL. 35 AUGUST, 1949 No. 8

Original Articles

PRESIDENT'S ADDRESS

AMERICAN ASSOCIATION OF ORTHODONTISTS

LOWRIE J. PORTER, D.D.S., NEW YORK, N. Y.

AS PRESIDENT of our American Association of Orthodontists, it is my privilege to remind you that it was just fifty years ago that the formation of a "society for the advancement of orthodontia" was first considered. Next year will be the fiftieth anniversary of the formation of a temporary organization, with Dr. Edward H. Angle as president and Dr. Milton T. Watson as secretary. The following year, in June, 1901, the first annual meeting of this society was held in St. Louis. As we enter into the final stages of a half century of great orthodontic progress, may we each gratefully bow to those founders who were able to look into the future and see the necessity for forming this great united society which has held our specialty so closely together, and in which there has been that one steadfast desire for greater and more extensive knowledge and research in orthodontics. It is that spirit which has led us on for nearly fifty years, and it was that desire for union which caused us to change from an American Society of Orthodontists to a great united national association of orthodontists, comprised of seven thriving, progressive components which represent all parts of the United States and Canada. It is my prediction that because of that oneness of purpose our great specialty will make even far greater strides in health service in the decades ahead.

I need not mention to you that great orthodontic hall of fame in which there are names to which our profession owes great debts of gratitude, but as we remember those who have been called before us, let us not forget that in our very midst are those who have given, and are giving, such outstanding contributions to our specialty in teaching and research and technical skill that they too will at some time be entering this great hall of unforgotten benefactors.

Presented at the meeting of the American Association of Orthodontists, Hotel Commodore, New York, N. Y., May, 1949.

Let us not, therefore, wait until their names are those of a memory, but rather let us at this time shower them with flowers of thanksgiving while they may still hear our voices and realize our appreciation for their great efforts to further us in our endeavors to be of maximum benefit in this important field of health service.

APPRECIATION TO ESSAYISTS, CLINICIANS, AND COMMITTEEMEN

I am not going to name the various officers, committees, and individuals to whom we all owe a great debt of gratitude. They have done their utmost to make this meeting a success for you. Your program, your entertainment, and your happiness in New York are entirely due to the untiring efforts of those who have so faithfully served us. I urge you to read their names in your printed program, and I hope that you will each express to them our appreciation for the splendid way in which they have so faithfully served us.

May I express to each one of you my sincere appreciation for your willingness to entrust me with the responsibility of being your administrative officer for the past year.

It has been my sincere wish throughout this year that, when my administration has been completed, you may feel that the great confidence which you expressed in making me your servant and presiding officer was, in a minor way, justified.

I hope your visit to New York will have been a worth-while adventure, for we have attempted to make this a "take home" meeting, with practical orthodontic applications and also a prominent place for research. Our research committee deserves high commendation for arranging this vital part of the program.

It is most fitting to express our thankfulness to the essayists and clinicians, each of whom has sacrificed and given of time, effort, and expense that you and I might benefit from his knowledge and experience in orthodontic advancements. Theirs is the meat of this convention, for which we are most grateful.

Our entire association appreciates the kindnesses of the Commodore Hotel in making our meeting a success through their generous spirit of helpfulness for our complete comfort.

I wish each one of you a wholesome, happy, beneficial time, my sincere thanks to you all for being here, and I extend ardent and sincere greetings to all orthodontists and guests who are with us from other countries. We are happy to have you here, and we hope you will enjoy yourselves and partake freely in all of our sessions. We appreciate having so many ladies in our registered attendance, and we hope you too will feel that your visit has been as enjoyable as our ladies' committees have so diligently tried to make it for you.

As my term of office draws to a close, it is my privilege to review with you some of the activities of your society during the past year.

NOMINATING COMMITTEE

First, I wish to congratulate you on your wisdom in establishing a nominating committee in this organization, for we are now far too large to have nominations made for executive offices until a complete survey has been made of our

entire membership. We must consider the service given to this association, the evidence of administrative capabilities, and also give consideration to sectional distribution of executive officers when feasible.

It is my sincere desire and hope that through your wisdom in the appointment of a nominating committee that we may have forever avoided any possibility of friction or jealousy in this great united orthodontic organization.

AMERICAN JOURNAL OF ORTHODONTICS

I next wish to compliment our editorial board and our editor-in-chief, Dr. Pollock, for the great efforts which they have expended in producing such excellent publications of the proceedings of this association and of our constituent societies. We can well be proud of our AMERICAN JOURNAL OF ORTHODONTICS for it is outstanding in comparison to other dental and medical journals. Because of the magnificient cooperation and interest of The C. V. Mosby Company, its great founder, Dr. C. V. Mosby, and its vice-president, our own Dr. Claude R. Wood, it is now definitely clear in our contract with them that the editorial board of the American Association of Orthodontists has complete control of editorial policies, published materials, and advertising, the latter being definitely limited to those products which are approved by the American Dental Association's Council on Dental Therapeutics. Our editor-in-chief is elected and paid in full by our association and is, by contract, no longer in any way subject to any possible approval or disapproval by the publishing company. While this has been the accepted policy between this organization and the C. V. Mosby Company for many years, it is much better for us to have our contract so worded that the American Association of Orthodontists has complete editorial control of our publication and thus definitely conforms to the ideal standards of professional journalism. This gives our AMERICAN JOURNAL OF ORTHODONTICS the high position where it rightfully belongs and has resulted in its being rated among the highest types of journalism by those who have attempted to make a classification of American dental literature.

A.A.O. RECOGNITION OF ORTHODONTISTS AND SOCIETIES

In the past history of this association, occasions have arisen in which we have been requested to receive officially certain representatives from orthodontic groups or study clubs who, in the opinion of your Board of Directors, did not meet the standards of orthodontic training or specialization which should be a requisite for official recognition by your association. In order that your Board of Directors might not be placed in a difficult or embarrassing position of this type, a resolution was adopted some time ago to the effect that the representative of no orthodontic group or society could be officially accepted by this association unless a committee had been appointed to study the standards and the qualifications for membership in the organization requesting recognition. This resolution was, in my opinion, insufficient and limiting in its scope, and we were, consequently, last year placed in a rather delicate international situation with one of our close and good neighbors when one of the representatives of their orthodontic association was sent to our meeting in Columbus, Ohio.

We were confronted with a professional problem which involved the good and welfare of the progress of dentistry and orthodontics, not only in this country, but which, if not remedied, could also develop into serious international misunderstandings.

Believing it was the duty of your president to put forth extreme efforts to avoid any regrettable and unintentional professional misunderstandings, I, immediately upon my return to New York, appointed a special committee to be known as "An Advisory Committee to Study the Qualifications of Orthodontic Organizations for Recognition by the A.A.O."

This committee, consisting of five members, was asked to study the situation and to make recommendations or to present resolutions to guide us in future situations which involved orthodontists or representatives of orthodontic organizations within the confines of the A.A.O., and also concerning those from other countries.

Two men on this committee visited the neighboring country concerned, and your president and others wrote many letters in an attempt to remedy any unfortunate misunderstanding which had been created, for we wanted our association to demonstrate also that splendid good neighbor policy which has always been so characteristic of our country.

This problem was deemed of sufficient importance for several of us from different parts of the country to attend a committee meeting in Washington, D. C., on June 6, 1948.

Resolutions were drawn up at that meeting which were approved by the committee, by two members of the A.B.O., two past presidents of the A.A.O., and your president, all of whom attended the meeting in Washington. Following that approval, the resolutions were sent to all members of the Board of Directors and to the Ad-Interim Committee, both of which voted a unanimous approval.

On the strength of this approval, your president has officially invited all recognized ethical orthodontic societies of South America, Europe, and other countries to attend or send their representatives to this meeting and to attend the International Luncheon which is to be a feature of this meeting. I strongly urge each one of you, both members and guests, to attend this luncheon. Important problems will be discussed which will be vital to the progress of orthodontics throughout the entire world.

After a thorough study of the problems involved, the committee presented resolutions, the first part of which dealt with a consideration of orthodontic organizations within the geographic boundaries of the A.A.O., while the second part dealt with a consideration of orthodontic organizations of other countries.

These resolutions read as follows:

"Part 1—WHEREAS the American Association of Orthodontists is our national official body of the specialty of orthodontics and is adequately represented by its constituent societies, and

"WHEREAS it may become desirable on occasions to recognize certain orthodontists or orthodontic groups, not members of this association, be it hereby

"RESOLVED that official representatives from other orthodontic groups in North America can be recognized by the A.A.O. only after

a thorough study of the qualifications and training required for membership in their respective groups and, in addition, upon the written approval of the constituent society of the American Association of Orthodontists which represents the district in which such groups are located.

"Part 2.—WHEREAS the American Association of Orthodontists recognizes that various influential factors may affect orthodontic conditions in other countries differently than those within its own territorial boundaries, be it hereby

"RESOLVED that the A.A.O. should welcome all ethical orthodontists from any other country to attend and participate in its annual meetings. Be it further

"RESOLVED that ethical orthodontic organizations from other countries or their representatives should be cordially received by the American Association of Orthodontists upon their furnishing credentials of recognition by their own national dental association or that they may occupy a position in their country comparable to the position of the American Association of Orthodontists in this country."

Realizing the great influential possibilities of this association on the future of international orthodontics, I strongly urge that we, as a body, unanimously adopt the resolutions presented. I wish to take this opportunity to express to that special committee my sincere appreciation for a big job, well done.

AMERICAN BOARD OF ORTHODONTICS

A prominent place is left in this address for a consideration of the vital position in our profession which is held by our A.B.O. This Board was the third national specialty certifying board in this country and the first national certifying board in dentistry. It was created in 1929 by the American Society of Orthodontists, upon the recommendation of the president, Dr. Albert H. Ketcham, who subsequently became its first president. Dr. Ketcham's dream has come true for his creation has now become one of the most important branches of our specialty.

Since 1929, several other national dental certifying boards have been created, and it is interesting to note that the oldest certifying board in dentistry, our A.B.O., is the only dental board whose requirements for certification have not been approved by the House of Delegates of the A.D.A.

Before the last war, the A.D.A. Council on Dental Education started work on a study of the types of specialization which should be recognized in dentistry and also concerning what qualifications should be required for the certification of specialists. The pattern used for the establishment of certification requirements for dental specialization was partially taken from the requirements established for the medical specialty boards, as prescribed by the Council on Medical Education and Hospitals of the A.M.A. Application for certification by medical boards required one year of hospital internship, plus three years of special study, and finally two more years of continued study or practice. That is, five years of study beyond the internship, making a total of six years after graduation from a medical college. Taking this as a pattern, the A.D.A. Council on Dental Education decided on a requirement of two years of special postgraduate study and at least three additional years of practice devoted principally to the specialty, although not necessarily full-time specialization. The

two years of special study might be given entirely to graduate work in an approved dental school or completely to special training in hospital or clinical internships or preceptorships, or both, if recognized by the council and by the specialty board.

At the present time, the requirements of four certifying boards have been approved by the Council on Dental Education and the House of Delegates of the A.D.A. The ideal requirements which they have approved are difficult to meet at this time because of a lack of educational facilities. Orthodontics is the only branch of dentistry in which two years of postgraduate university training is available, and that is true in only one or two universities. In all of our dental universities, a total of only about 100 to 120 full-time graduate and post-graduate orthodontic students can be accommodated. It is therefore a questionable procedure to establish requirements for certification of specialists which cannot be strictly enforced by the certifying board, and for that reason the A.B.O. has been opposed to the adoption of the standards set by the A.D.A. Council on Dental Education.

The A.B.O., at present, requires five years of complete specialization, and I believe will be highly in favor of requiring that a part of that time be graduate or postgraduate university training, as soon as university facilities have been so enlarged that applicants for such training will not be refused admittance because of university incapacities. Until university training is sufficiently available, we cannot expect our A.B.O. to agree to the establishment of requirements which are beyond the reach of most applicants. Our A.B.O. requirements of reports of 10 or 15 completed cases, a 3,000 word thesis on original material, plus a careful personal investigation and examination and five years of complete specialization should, I believe, be recognized by the A.D.A. Council on Dental Education as sufficient for certification at present, but I sincerely hope and fully believe that requirements for A.B.O. certification will, in the near future, demand a certain amount of university postgraduate training. I believe all applicants will eventually be required to have graduate or postgraduate university training for both A.B.O. certification and for A.A.O. memberships, but until that becomes possible, other means of orthodontic education must be accepted.

We should give cognizance to the fact that university postgraduate training is of more value than preceptorships, and we must also agree that preceptorships are generally of more value than no special training of any kind. Consequently, the requirements for certification and for society memberships should vary according to the type of education received.

In view of the previous discussion, I believe we should consider some changes in requirements for membership in the A.A.O., which would also change somewhat the requirements for A.B.O. certification. I believe certain changes, if adopted, would go a long way toward a mutual agreement between the A.D.A. and the A.A.O. in regard to full approval of the A.B.O. as the national certifying board in orthodontics. A.D.A. approval is, of course, not mandatory, and the functioning of the A.B.O. will not be changed either with or without that approval, but it would surely be desirable for us and for all diplomates of the A.B.O. if it could be said that our certifying board is fully approved as such by

our national dental society. It is interesting to note that it has not been the intention of the A.B.O. merely to certify large numbers, but rather it has had a continuous desire of having its requirements continually advance as orthodontics and educational facilities progress.

I believe the gap between A.D.A. approval and nonapproval of the requirements for certification by the A.B.O. is very small and that through mutual cooperation we could arrive at a full agreement which would be of great value to all in this great dental profession of which we are a vital part.

The A.D.A. approved requirements for certification include citizenship in the United States, as well as membership in the American Dental Association or the National Dental Association, but many of our members are not from the United States and consequently are not A.D.A. or N.D.A. members or citizens of the United States. This, as a definite requirement by the A.D.A., is wrong, in my opinion. Approval of certifying boards should be given by the A.D.A. for certification of all A.D.A. members who are qualified, but the A.D.A. should not *limit* the boards to certification of A.D.A. members *only*. Since the A.A.O. consists also of Canadian members and one Cuban member, it would be well if the national dental associations of those countries would also approve the A.B.O. for certification of any of their members who are also members of the A.A.O. I fully believe that if this were properly explained, the A.D.A. would readily approve the A.B.O. requirement of A.A.O. membership for certification, since the A.A.O. requires that each member "be in good standing in his local, state, and national dental organization." Other differences could also likely be adjusted through mutual endeavors.

A.A.O. MEMBERSHIP CHANGES

I now wish to talk to you about some possible changes in requirements for membership in this organization and in its constituent societies, which I hope may also affect the requirements for A.B.O. certification. We owe to our orthodontic specialists an opportunity gradually to train themselves sufficiently to eventually become eligible for A.A.O. membership, and finally to attain that eventual goal of becoming diplomates of the A.B.O. To do this properly, we should make it possible for all those who have definitely indicated their intention to enter orthodontics as a specialty, to be accepted as associate or probationary members of the various constituent societies, until such time as they become eligible for active membership in the A.A.O. It would be advantageous to us all if those desiring to specialize were taken into the constituent societies very early in their careers so they could have proper guidance and the advantages of orthodontic training through attending scientific programs and by personal association with those who are more mature in the specialty.

I have spent much time and thought on the membership suggestions which I am about to recommend to you. I have consulted with many members from various constituent societies in my attempt to establish efficient, sensible, and progressive changes, although even these, through the course of time, may need to be changed considerably as greater educational facilities become available. At present, I believe we should establish requirements for society memberships

and for A.B.O. certification in accordance with our concepts of the relative values of postgraduate university orthodontic training, preceptorships, and of approved informal short courses. There is a strong feeling that eventually university postgraduate training will be mandatory, and that preceptorships or specialization without formal training may be entirely unacceptable, but such ideals cannot be realized at this time. Some sections have desired exceptionally high requirements for both associate and active memberships, while others have been very lenient. A few members have even believed that no changes in membership requirements should be made, either by the A.A.O. or the A.B.O., but our specialty will only progress as our thoughts progress with educational improvements. Qualifications for applicants should be higher than in the past, but we must not let our goal be so high at this time that discouragement will prevail for those serious, conscientious practitioners who wish to be one of our specialty. We cannot jump to the top of the ladder immediately, but rather must steadily climb, step by step, to an eventual ideal in membership requirements.

Throughout the opinions of those with whom I have consulted there has been a predominant belief that all constituent societies should have associate members and that the requirements for such memberships should be uniform in all sections. They have also believed that the established requirements for active memberships in the sections should be uniform, for active members in the sections automatically become active members of the A.A.O. Membership requirements should be raised considerably in some sections and lowered in others, for I believe the requirements in some sections may be too high at this particular time in our orthodontic progress.

It is my belief, and that of many others, that associate memberships should be established in the constituent societies *only* and not in the parent body, and that associate membership requirements should be low enough to include specialists early in their careers. Associates of a section would have all privileges of attendance, in the section and also in the parent body, upon payment of a small guest fee, but, in my opinion, these younger members should not have to pay dues to the parent body unless they were able to attend the annual sessions.

CONSTITUENT SOCIETY—ASSOCIATE MEMBERSHIP

I, therefore, recommend for your consideration that all constituent societies create associate memberships and that the requirements for such membership be:

1. One calendar year of full-time university graduate or postgraduate orthodontic training—recommendation to be by head of orthodontic department.
2. One year of preceptorship with an active member of the A.A.O.—recommendation to be by preceptor.
3. An equivalent of the above two. The equivalent may include orthodontic training from informal courses, seminars, or preceptorships which may satisfy the membership committee that he is a qualified practitioner—recommendation by two A.A.O. members.
4. Two years' specialization, which *must* include orthodontic training from informal courses, seminars, or preceptorships which may satisfy the membership

committee that he is a qualified practitioner—recommendation by two A.A.O. members.

I also recommend that any acceptable dentist who has completely limited his practice to orthodontics for a period of three months should, upon request, be invited to attend the sectional society meetings for a period of two years, during which time he should be able to qualify for associate membership.

I realize that a preceptorship is not equal to university training, but any man who is associated with an A.A.O. member could, I believe, be accepted as an associate of a constituent society after one year of preceptorship.

I realize that "an equivalent of university training or preceptorship" is a questionable qualification, but we must also realize that at present there are not enough opportunities for university training or preceptorships, and we consequently should not retard those who are willing, desirous, and ambitious, but are unable to obtain training except through seminars, approved informal courses, short preceptorships, etc.; I believe, however, that we should definitely reject those who have not taken advantage of at least some type of training in preparation for specialization.

In my opinion, associate memberships should be established as a probationary class and should be limited to a period of five years, during which time an associate member should be able to qualify for active membership. Upon accepting associate membership, he must agree that if he does not qualify in five years, he will automatically be dropped from membership in his sectional society. If an associate member is practicing in a small town where specialization is impractical, I believe the sectional society should invite him to continue attendance at their meetings, perhaps as a paying guest, after his associate membership has ceased. There is a great demand for capable men to practice orthodontics for part time in the smaller towns. We have a definite obligation to the public to see that these areas are taken care of from an orthodontic standpoint. Such men should have the opportunity to continue their orthodontic contacts and education, for that is important for the good and welfare of the public.

ACTIVE MEMBERSHIPS (A.A.O. AND SECTIONS)

Proposals for active membership in a constituent society must be very carefully considered by the membership committee of that section. They are the emissaries of the parent body, for they not only recommend active memberships for their section, but also by so doing must assume the full responsibility of recommending that applicant for full active membership in the parent body.

For that reason, I believe all constituent societies should agree to uniform requirements for active memberships. The present requirement of only three years' specialization is, in my opinion, much too low, but it is also possible that we might establish requirements which are far too high. We must not lose sight of the fact that educational institutions are now desiring four years of college training before entering a four-year dental education. After that, another year of postgraduate training is essential before entering a specialty, which makes a total educational period of nine years. After that, several years of specialization are required to become an active member in our association. Finally, there

is another period of testing before becoming eligible to apply for a certificate of proficiency by the national certifying board. Let us, therefore, set our goal high, but not so high that it is going to discourage men from entering orthodontics as a specialty.

After careful thought, I wish to recommend the following requirements for active membership in the A.A.O., which under the present method of transfer of active membership from the section to the parent body, would also necessarily be the minimum requirement for active membership in the constituent society. I believe an applicant for active membership should have been an associate member of a constituent society for at least one year, after which he could apply for active membership, providing he meets one of the following requirements and is recommended by two active members of the A.A.O.:

1. Three years of specialization, including one calendar year of full-time university graduate or postgraduate orthodontic training.
2. Three years of specialization, including two years' preceptorship with an active member of the A.A.O. or an equivalent suitable to the membership committee.
3. Four years of specialization, which *must* include some informal training in preceptorships, suitable short courses, or seminars which satisfy the membership committee that he is a qualified practitioner.

No application for active membership should be considered if the applicant has had no form of special training in preparation for specialization.

REQUIREMENTS FOR A.B.O. CERTIFICATION

At the present time, an applicant for A.B.O. certification must have been specializing for a period of five years.

I recommend that this be changed to a requirement of not less than two years' active membership in the A.A.O.

That would mean that all present active A.A.O. members would, after a two-year membership, be eligible to apply for A.B.O. certification, for by that time they would have specialized for five years, the same as the present requirement.

Future members of the A.A.O., if the above requirements for A.A.O. membership were adopted, would be required to have:

1. Five years' specialization, including one calendar year of full-time university graduate or postgraduate orthodontic training.
2. Five years' specialization, including two years' preceptorship with an active A.A.O. member or an equivalent suitable for having elected him to active membership in the A.A.O.
3. Six years' specialization, *including* informal training in preceptorships, suitable short courses, or seminars which have made him eligible for active membership in the A.A.O.

It is quite possible that we may be able to eliminate preceptorships and specialization without formal training within the next few years, depending upon the advancement in dental education, but at present I do not believe they should be eliminated.

MEMBERSHIP SUMMARY

The following is a summary of the membership requirement recommendations mentioned:

Associate memberships in all sections:

1. One calendar year of full-time university graduate or postgraduate orthodontic training—recommendation to be by head of orthodontic department.

2. One year of preceptorship with an active member of the A.A.O.—recommendation to be by preceptor.

3. An equivalent of the above two. The equivalent may include orthodontic training from informal courses, preceptorships, or seminars, which may satisfy the membership committee that he is a qualified practitioner—recommendation by two A.A.O. members.

4. Two years' specialization, *including* orthodontic training from informal courses, preceptorships, or seminars, which may satisfy the membership committee that he is a qualified practitioner—recommendation by two A.A.O. members.

I believe associate memberships should be established as a probationary class and should be limited to a period of five years, during which time an associate member should be able to qualify for active membership in the constituent society, which would automatically make him an active member of the A.A.O. Upon accepting associate membership he must agree that if he does not qualify in five years, he will automatically be dropped from membership in his sectional society.

Active membership in A.A.O. and sections:

After one year of associate membership in his constituent society, an applicant will be eligible to apply for active membership if he has had:

1. Three years of specialization, including one calendar year of full-time graduate or postgraduate university orthodontic training—recommendation by two active members of the A.A.O.

2. Three years of specialization, including two years' preceptorship with an active member of the A.A.O. or an equivalent suitable to the membership committee—recommendation by two active members of the A.A.O.

3. Four years of specialization, including informal training in preceptorships, suitable short courses or seminars which satisfy the membership committee that he is a qualified practitioner—recommendation by two active members of the A.A.O.

No application for active membership should be considered if the applicant has had no form of special training in preparation for specialization.

Requirements for A.B.O. certification:

Two years' active membership in A.A.O.

This would mean no change in requirements for all present A.A.O. members (five years' specialization).

Future A.A.O. members would be required to have:

1. Five years' specialization, including one calendar year of full-time university graduate or postgraduate orthodontic training.

2. Five years' specialization, including two years' preceptorship with an A.A.O. member or an equivalent suitable for having elected him to active membership in the A.A.O.

3. Six years' specialization, including informal training in preceptorships, suitable short courses, or seminars which have made him eligible for active membership in the A.A.O.

RECOGNITION OF A.B.O. DIPLOMATES

I further recommend that some special ceremony take place at each annual meeting of the A.A.O., giving suitable recognition and congratulations to those of our members who have been approved by our national certifying board and thus have become diplomates of the A.B.O.

I also recommend that all of our members who have been certified be so designated in our membership list by placing an asterisk by their names with a footnote indicating that they are diplomates of the A.B.O.

The importance of certification cannot be overemphasized, for it is becoming most important for the reference of patients and for the appointment of members for hospital, clinical, and educational staffs. The New York State and New York City Boards of Health require A.B.O. certification for the Chief of Staff of all orthodontic clinics taking part in the orthodontic program for the care of state and city rehabilitation cases. By a public recognition of all newly certified members, we would definitely indicate to the entire dental profession that we are completely back of and fully in accord with the actions and proceedings of the national certifying board in our specialty.

As our membership gradually increases in the number of A.B.O. diplomates, we may decide at some future time that it would be well to create a fellowship in the A.A.O., by which all diplomates of the A.B.O. would become Fellows of the A.A.O., but that, perhaps, is somewhat premature at present. This is a matter which must be carefully considered, for by honoring a diplomate we would not want to create any jealous or antagonistic feelings on the part of any other fine A.A.O. members who have not been able to apply for certification.

I believe the recommendations mentioned, if adopted, would be a great improvement to our association and to the A.B.O. They would be within the present possibilities of dental education, and yet would not be unjustly discriminatory. They would definitely raise the standards for membership and certification and yet would not be discouraging to the progress of dental specialization. They would go far toward reaching a stage of approval of our certifying board by the A.D.A. House of Delegates, for we could then agree to change our requirements for qualification as soon as educational facilities make it feasible, for that would be our eventual goal, regardless of A.D.A. approval.

STATE LICENSING OR CERTIFICATION

At the time of writing this address, six of our states have so changed their laws that they are now licensing dental specialists. Some of these states require full-time and others only part-time specialization. Some believe that a national

certifying board is sufficient, while others feel that each individual state should have control and jurisdiction over those who claim to be specialists in that state. Many disagree with the opinions of the Committee on Dental Education of the American Dental Association concerning certification and licensing. It is quite possible that a practitioner may become sufficiently proficient in a specialty that he may be fully qualified to practice that branch of dentistry, even though he may not completely limit his practice to that specialty. Whether he limits his practice or not, his training should be thorough; at the present time this can, in most universities, be given only through graduate or postgraduate study. There is a lack of time and facilities in most undergraduate curriculums, which limits orthodontic training primarily to the essential phases of preventive orthodontics which enable the graduate to guide his patients because of his ability to differentiate between normal and abnormal developments.

It is the belief of some that those who have had sufficient orthodontic training should be licensed or certified by the state so that smaller towns that cannot support a specialist may know who is capable of giving adequate and dependable orthodontic care. Such a certificate could only approve past training but could not certify proficiency, for that can be determined only after several years of practice. Determination of proficiency is the object and duty of the national orthodontic certifying board. It is possible, therefore, that state licensing and national certification may not conflict.

This association should take some definite stand on this matter for the guidance of the states contemplating such procedures, but it involves many aspects and questions which require diligent study, for there are at present great variations of opinions.

I therefore recommend that a special committee be appointed to study this problem and report to us so we may be better able to take some definite stand.

ELECTION OF DIRECTORS

I wish to make another recommendation which is in regard to the election of directors.

The bylaws of this association provide for the election each year of one director and one alternate director from each section to serve for a period of one year on the Board of Directors. A suggestion has been made by a member of the Great Lakes Society of Orthodontists which I wish to recommend for your consideration. He believes that one year on the board of directors is frequently too short a period for a director to carry out programs which he and his constituent society may have contemplated. I am, therefore, happy to recommend that each sectional director be elected for a period of two years. I also recommend that the alternate director be selected with the plan of possibly making him the director when the term of the elected director expires. In order that the alternate may be familiar with the working plans of the Board of Directors, I would suggest and recommend that the alternate director be requested to sit in on all board meetings, but without the power to vote or give expression of opinions unless so instructed by the president and at the request and permission of the elected director. Our directors have many problems to solve which are vital to the protection of the public's welfare.

ORTHODONTIC LABORATORIES

We are the ones who must guard and protect our people from unsound orthodontic advice by those who lack sufficient knowledge to have sound judgment or who are unscrupulous in their conduct.

It is pertinent to mention here that some orthodontic laboratories are apparently offering unjustified advice on orthodontic treatment to the dental profession.

I was called in consultation on a case a few weeks ago where an orthodontic laboratory had advised a dentist to extract four premolars for a 12-year-old child patient. This advice was given only from the examination of plaster casts. Neither the patient, photographs, nor the radiograms had ever been seen by the laboratory. Apparently to avoid legal entanglements, the advice was typewritten on a plain sheet of paper and was unsigned by the laboratory management. In my opinion, the diagnosis was very unsound for that child, although I am definitely in favor of extractions in certain cases. Such things are a gross injustice to the public, and it is our duty to try to protect them against such abuses. If these procedures cannot be stopped through legislation, it is then time that we get busy through educational channels to warn the dentists and the public about the dangers of accepting such advice from unreliable sources. This matter has been referred to our public relations committee where I know it will be capably handled.

CHILDREN'S BUREAU—FEDERAL SECURITY AGENCY

During the past year we received a request from Dr. John T. Fulton, the dental services adviser to the Federal Security Agency of Washington, D. C., asking that the A.A.O. appoint a committee to serve as consultants to the Children's Bureau. Believing that it would be your desire that the national orthodontic body cooperate to the best of our ability in helping to establish desirable programs for the public health care of dental cripples in childhood, I appointed a committee of six prominent orthodontists as the Public Health Committee, the names of whom will be found in your program. This committee and your president met with the dental advisers to the Children's Bureau in Washington, D. C., on Dec. 13 and 14, 1948. I will leave it to that committee to report on this conference, but I want you to know that the Children's Bureau was very interested in the health service given to cleft palate patients in 28 states and also in the service to orthodontic cripples which is given only in two or three states. They are anxious that similar orthodontic programs to that which has been conducted in New York for five years be established in all states, if possible.

The establishment of such programs would do much to prevent the adoption of other undesirable and inefficient public health plans.

PUBLIC HEALTH PROGRAMS

One of the most vital issues facing the United States Congress today is the public health care of our nation's people. It is headline material, which is receiving both professional and governmental attention.

There has been a broadening of the concept that the people of this nation are entitled to the best possible protection of their health and the best possible treatment when they are ill. This is a highly laudable ideal which I am sure no one here will deprecate. It is because of the belief in this ideal by the medical and dental professions that there has been a constant forward march over a period of years and a steady progress in the prevention of sickness and disease in this country. At the present time, we have the highest rating in medical, dental, and hospital service of any country in the world. During the past few years the medical profession in this free country has been able through extensive research to so combat diseases that were formerly fatal, such as diphtheria, typhoid, smallpox, and malaria, that there has been a tremendous reduction in mortality. In fact, the life expectancy has increased about twenty years. Now, very important new developments are coming forth in regard to the prevention and cure of cancer, infantile paralysis, heart disease, and tooth decay, so we must all admit that the most vital phase of health benefits is scientific research in the preventive aspects of diseases.

The medical and dental professions are most concerned about the possibility of creating a greater and better health service to the people. They are interested in having these services efficient, workable procedures, which will not be so involved with red tape that the practical aspect of real service to the people will have been regressive rather than progressive from its present position in health welfare.

Efforts have recently been expended in this country to foster a national compulsory health service. It is a problem to which we must give our utmost thought and consideration, for many of us do not believe that compulsory insurance, financed through further deductions from the pay rolls of the people, is going to be the answer to improvement in general health welfare, if we consider the importance of economy, efficiency, and quality work.

Compulsory health insurance is not new. It dates back to 1883 when Bismarck introduced that system in Germany. Since that time, despite its many faults, it has been copied by politicians in many European countries. Denmark's voluntary insurance scheme adopted in 1892 was based on a system of inducing, rather than enforcing, self-help. France adopted a compulsory insurance program in 1930 for industrial, commercial, and agricultural workers with voluntary insurance available to others. In 1912, Prime Minister David Lloyd George of Great Britain introduced in that country a compulsory health insurance for manual workers earning less than $1,000 per year. Both the employer and worker contributed to that program. There are great variations of opinions regarding the benefits of that scheme, but the American observers unanimously reported that dental health standards in Britain were infinitely inferior to those in the United States.

On July 5, 1948, Britain abolished the old plan and adopted a more comprehensive program of so-called "free" health care which is paid through taxation. The costs have proved to be far above the original estimates.

In the summer of 1948, the Canadian Dental Association made a study of dental service in Great Britain. After this report had been thoroughly studied,

their health insurance committee passed a resolution on Nov. 8, 1948, opposing the adoption of a plan similar to the National Health Service Act of Great Britain, believing that it "would ultimately prove to be a *regression* rather than an advancement in the dental health standards of the people of Canada."

The Australian Labor Government, in 1947, adopted a so-called "free medical law," but an amendment has just been passed whereby physicians who do not agree with this system are now subject to a fine of $150 if they do not cooperate with that scheme.

This type of nationalization of any industry is not the way of the enterprise systems of America where FREEDOM has forever been our motto!

I have just enumerated some of the professional aspects of compulsory health insurance. Now listen to a few statements of one of our great unbiased American citizens who has been commissioned by our Congress to study federal expenditures. The following facts were nationally broadcast ten days ago by the Honorable Herbert Hoover:

1. At the present time, our federal government is legally liable for the care of twenty-four million of our people, about one out of every six persons, at an annual expenditure of two billion dollars.

2. The federal activities in research and medical treatment are now overlapped in forty different federal agencies.

3. Although federal hospitals now have seventy thousand empty beds, the government is constructing, or has authorized for building, hospitals for fifty thousand more beds.

4. New federal hospitals are being built in many areas where there are already empty hospital beds.

5. Government-built hospitals are costing from 30 to 50 per cent more per bed than private hospitals.

He stated in this broadcast that we are now spending twenty-three billion out of our forty-five billion dollar budget on national defense in this cold war, and that if we want this nation to survive, new government spending should be curtailed. He finished the broadcast by saying that this responsibility lies with the Congress who will take that initiative only if there is public interest and public pressure, and that we need a period when the people just sternly say to Congress, "No added projects and expense until this cold war is over."

In view of this discussion, I therefore conclude that (1) since it is our belief that the adoption of compulsory health insurance plans, such as have been presented in three separate bills to our Congress, would impose a much greater taxation on our people and add tremendously to an already staggering national debt, (2) since the American Dental Association and other organizations have proposed other health plans which would, in our opinions, more ably and efficiently and economically care for the health of our nation, (3) since we believe it is for the good and welfare of this country that we do not adopt plans that have proved to be so enmeshed in blanks and forms and red tape, which interfere with adequate service and quality work and which stifle that individual initiative which is the backbone of American progress, (4) since we believe that the responsibility

which should be assumed by the federal government in health welfare is not in government control of the professions but rather is in government assistance in the promotion of research, the construction of more locally controlled hospitals, the financial aid for obtaining adequate university teaching staffs, and the expansion of medical and dental schools to increase professional personnel, which is greatly undermanned at present (there were seventeen thousand applicants to study dentistry last year but university facilities could accommodate only three thousand), (5) since we believe that extensive, adequate, and high-quality health care would be produced for the middle and lower income groups, through a voluntary insurance system, together with federal assistance to community and state centers, and (6) since we sincerely and emphatically believe that health plans will develop more efficiently under professional guidance than under federal bureaucracy, I strongly urge that the following resolutions be unanimously adopted by this association:

WHEREAS there are now pending before the Congress of the United States three bills, S-5, HR-345, and HR-782, commonly known as the Wagner-Murray-Dingell Bill, the object of which is to establish a system of compulsory health insurance in the United States, and

WHEREAS the experience of other nations of the world which have adopted such a system has demonstrated that compulsory health insurance does not materially improve the health of the people of such countries, and

WHEREAS the people of the United States today have the best and most extensive dental, medical, nursing, and hospital service care that the world has ever known, and

WHEREAS the great advances in the health professions heretofore have been made as a result of individual initiative, and

WHEREAS the American Dental Association has recognized the need for a wider distribution of dental care and has endorsed the principle of voluntary dental insurance as a means to that end, be it therefore

RESOLVED that the American Association of Orthodontists does hereby memorialize the Congress of the United States not to enact any legislation containing the principle of compulsory health insurance, and be it further

RESOLVED that a copy of this resolution be forwarded by the secretary of each component society of the American Association of Orthodontists to the senators and representatives in Congress from their states and to the speaker of the House of Representatives and the president of the Senate of the Congress of the United States and the President of the United States.

With all of our joys we have moments of sorrow, for some of our closest friends are missing this year because they have been called to a greater service. With sadness in our hearts we send them a final salute.

And now, to those of you who have been spared so that we can again be together, I wish you good luck and happiness throughout the coming year, and may God's blessing be with you always.

Thank you.

41 EAST 57TH STREET.

CRITERIA FOR EXTRACTION IN ORTHODONTIC THERAPY RELATED TO DENTOFACIAL DEVELOPMENT

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It is difficult to lay down any precise rule regarding extraction, but it is a matter which involves the broadest consideration and closest study of each case, often taxing the judgment as much as does any problem in orthodontia. A rule which the author has followed for some time when at all in doubt, is to pursue treatment according to the conservative method, studying the relations of the dental arches and features carefully, until a certainty in the matter shall become apparent.—*E. H. Angle.*[16]

INHERENT GROWTH AND FUNCTIONAL ADAPTION

THE manifestation of growth in an individual is the expression of the inherent growth pattern as it is modified by function and pre- and postnatal internal and external environmental factors. In his attempts to change existing expressions of growth, viz., malocclusion, the orthodontist should realize that in addition to his circumscribed knowledge of technical procedure he is limited also by the inherent growth pattern and by the internal and external factors which affect this pattern. The orthodontist cannot permanently change human morphology at will simply by using some special "system" of appliance therapy.

Interrelationship of form and function is an accepted fact among orthodontists. Wolff's law[1] has been quoted in countless orthodontic articles and is today a banality in orthodontic literature. However, few in orthodontics are aware that certain anatomists regard the belief in an inherent growth pattern to be in conflict with the theory of functional adaptation.[2]

Wolff's law refers to the adaptive changes in the functioning bone. The fact that the internal architecture of bones at birth exhibits a structural arrangement approaching that of a functioning bone can be attributed to the stress of neuromuscular contraction and the vascular pattern during the fetal stage.[3] Townsley[2], however, attributes the similarity of the bone pattern in the prefunctional state to that of the functioning bone to an architectural evolution along mechanical principles which occur throughout phylogenetic development. According to Townsley, as a result of the evolutionary process, favored by the law of natural selection, the mechanically determined structures present themselves as hereditary features in the individual. No matter which viewpoint we follow, the fact remains that, like heredity and environment to which they are related, there is actually an interrelationship between the theory of an inherent growth pattern and that of functional adaptation.

Presented before the American Association of Orthodontists, May 3, 1949, New York, N. Y.
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The late D'Arcy W. Thompson,[4] in his work "On Growth and Form," concluded: "Skeletal form as brought about by growth is to a very large extent determined by mechanical considerations, and tends to manifest itself as a diagram or reflected image of mechanical stress." Thompson stated that in the plan and construction of an individual bone, as well as of the skeleton as a whole, there is a tendency for material to be laid down ". . . just in the lines of stress and so to evade thereby the distortions and disruptions due to shear." Shearing stresses in bone are overcome when the minute structure of bone arranges itself in stress lines or trajectories along the main lines of force.

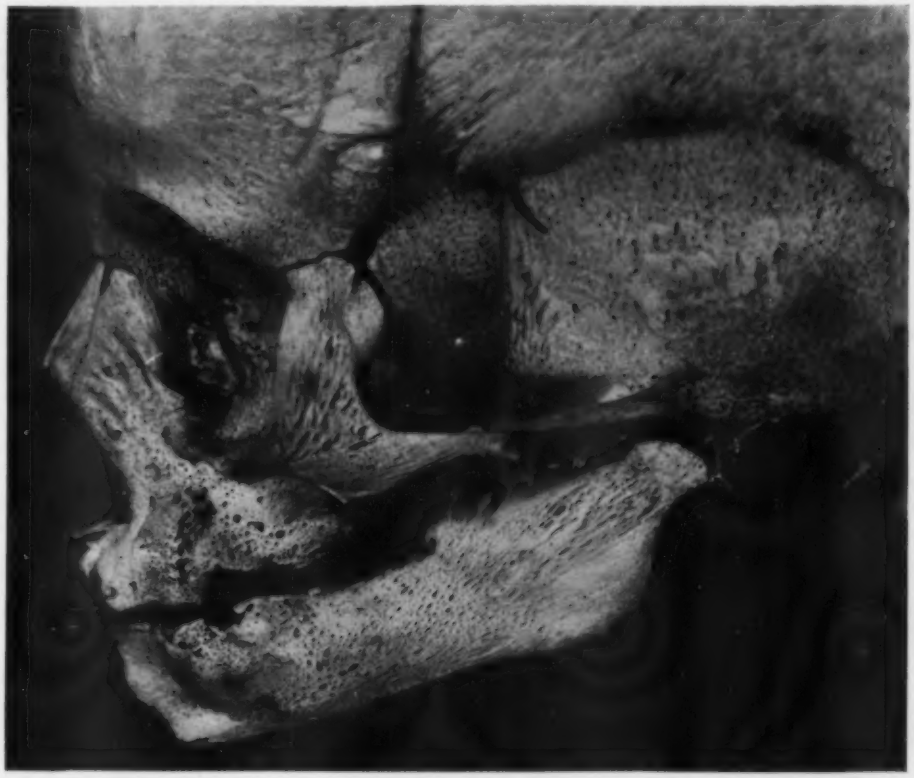


Fig. 1.—Skull of a fetus. Although the bones are still in the prefunctional state, the trabeculae of the cancellous portions of the maxilla, malar, and mandible run along trajectorial lines and in the direction of functional stress. This pattern of bone architecture is similar to that exhibited in the functioning, postnatal skull in which the trajectorial pathways follow the main lines of functional stress. (Courtesy of Dr. Spencer R. Atkinson, Pasadena, Calif.)

Almost two hundred years after Havers[5] (1729) described the Haversian system of bone, Roux[6] (1881, 1895) presented the theory of the functional adaptation of organisms and related the internal architecture and gross outer form of bones to functional stimulation and adaptation. Wolff (1892) then pronounced his law of the transformation of bone. By means of x-ray studies, Walkhoff[7] (1900, 1902) tried to coordinate the trajectorial structures of the mandible with functional influences and arrived at the conclusion that the inner architecture and outer form of bones are the results of function.

Bluntschli and Winkler[8] (1927) described the "basal arches." These areas are the more or less constricted portions of the jaws, located superjacent to the alveolar process in the maxilla and subjacent to the alveolar process in the mandible. Bluntschli[9] (1926) referred to the trajectories of the jaws—the structural arrangement of the Haversian systems through which stresses generated by the dentition are transmitted—as the internal stress lines of the jaws. Benninghoff[10] (1925-1936) in a series of papers described his experiments which demonstrated the trajectories of the jaws.

THE CLOSED FUNCTIONAL SYSTEM OF THE JAWS

In a paper read before the Northeastern Society of Orthodontists in February, 1948, the writer[3] pointed out the basic relationship of the trajectories of the jaws and the basal arches to orthodontic therapy, especially their role in determining the need for extraction as an adjunctive orthodontic procedure.

Masticatory and other forces exerted on the teeth are concentrated in the basal arches of the respective jaws and transmitted to the base of the skull through three main trajectorial pathways located in the maxilla. These pathways are: the frontonasal (Fig. 2, *A*), the malar-zygomatic (Fig. 2, *B*), and the pterygoid (Fig. 2, *C*). The trajectories of the jaws, the writer pointed out, are to be found even in the fetus, before postnatal functional forces begin to exert themselves.[3]

In a recently published monograph entitled *The Trajectories of the Jaws*, Seipel[11] stated that development of the dentition is accompanied by the destruction of the trajectories and their reorganization after the permanent teeth are erupted. Since the permanent teeth during their course of eruption develop a new alveolar process, this statement by Seipel cannot hold true. The trajectorial arrangement of the alveolar process in the permanent dentition is entirely different from that of the deciduous dentition. This is the immediate and underlying reason why normal occlusion in the deciduous dentition is not necessarily an indicator of normal occlusion in the permanent dentition.

Bluntschli,[12] Wetzel,[13] and recently Seipel[11] have shown that there exists a closed functional system between the trajectories of the jaws, the teeth, and the muscles of mastication. The functional system of the face exhibits a mechanical balance of pressure and contra-pressure through the arrangement of muscles, bones, and dentition. This closed functional system plays only a secondary role to the bones of the cranium itself in absorbing the stresses generated in the dentition.

Wetzel[13] has shown that the muscles of mastication contra-act tendencies to bone deformation which their own contractions exert in masticatory pressure. Thus the internal pterygoid muscles pull the pterygoid process backward and downward while masticatory force presses the bone upward and forward. The upward deflection of the zygomatic bone is contra-acted by the downward pull of the masseter.

The forces of mastication are then, to a certain extent, structurally bound within the facial skeleton itself. Masticatory force is transmitted through the dentition from the mandible to the maxilla from whence it is distributed through the three main trajectorial systems, leading to the frontal, zygomaticotemporal

and sphenocranial base regions. The trajectories form direct muscular connections at the zygomatic and pterygoid processes and to some extent also in the temporal region. Thus, a closed functional system is formed which includes the mandible, the dental arches, the upper facial bones, and the muscles of mastication.

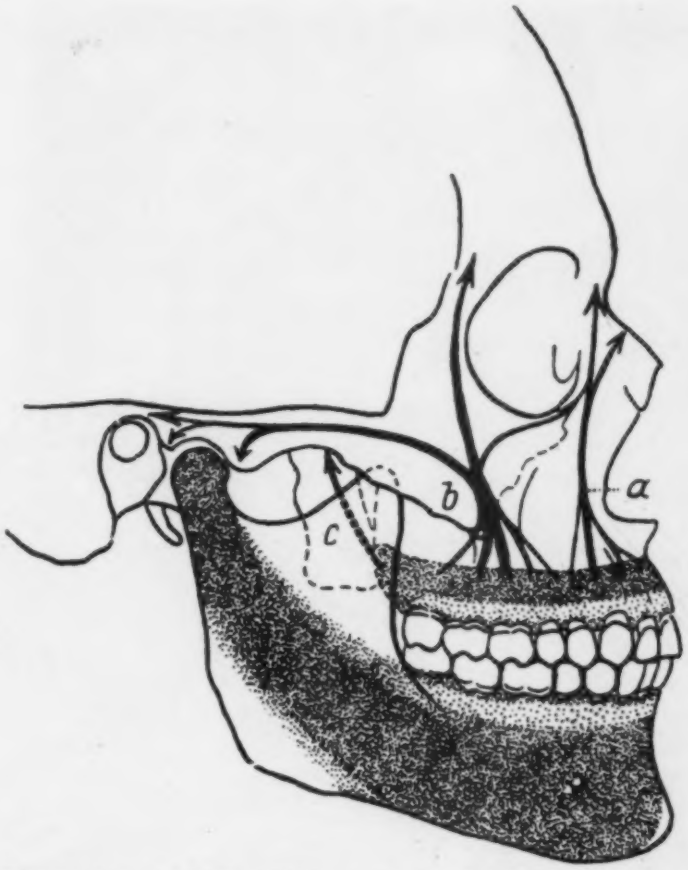


Fig. 2.—Comparative size and outline of the basal arches (shaded portions) of the maxilla and mandible and the distribution of the main trajectorial pathways through the maxilla to the base of the cranium. (After Bluntschli and Winkler.)

The closed functional system begins with the dentition, goes through the trajectories of the maxilla to the base of the skull and to the adjacent muscular insertions, from whence it goes back through the muscles of mastication to the base of the mandible, and from there through the mandibular trajectories, completing the chain at the dentition. This closed functional arrangement limits the area in which the orthodontist can place the teeth in his attempts to eliminate malocclusion. Mershon[14] long ago recognized these limitations when he said, "We can put the teeth where we think they belong but nature will eventually place them where they actually belong."

In the absence of local interferences, including dentofacial habits, which are strong enough to overcome inherent growth tendencies, the teeth must perforce arrange themselves in consonance with the lines of stress of the closed

functional system established by the trajectories of the jaws and muscles of mastication, in order to avoid shearing influences and to maintain a state of functional equilibrium. When the basal arches are large enough, in proper relationship, and other local factors are too weak to exert interfering influences,

Fig. 3. *A.*—Casts taken before and after orthodontic treatment. All four permanent first molars had been extracted because of periapical abscess or pulpal infection.

the teeth attain a normal occlusal arrangement; otherwise malocclusion manifests itself. Malocclusion resulting from basal arch deficiency is related to abnormalities of jaw development and growth and cannot be treated merely from the standpoint of tooth malrelationship by so-called "rounding out" of

the arches; this method of orthodontic treatment brings the teeth into conflict, or a state of shear, with the closed functional system of the jaws (Fig. 3, *A*, *B*, and *C*).

Seipel advanced the following hypothesis of orthodontic changes: "Orthodontic changes are facilitated where tooth movements are going parallel to trajectorial structures within the alveolar bone, without breaking the continuity of the trajectorial pathways or stretching them. When the trajectorial systems are stretched or broken, the trajectorial adjustment is encumbered and the orthodontic results are unsafe."[11]

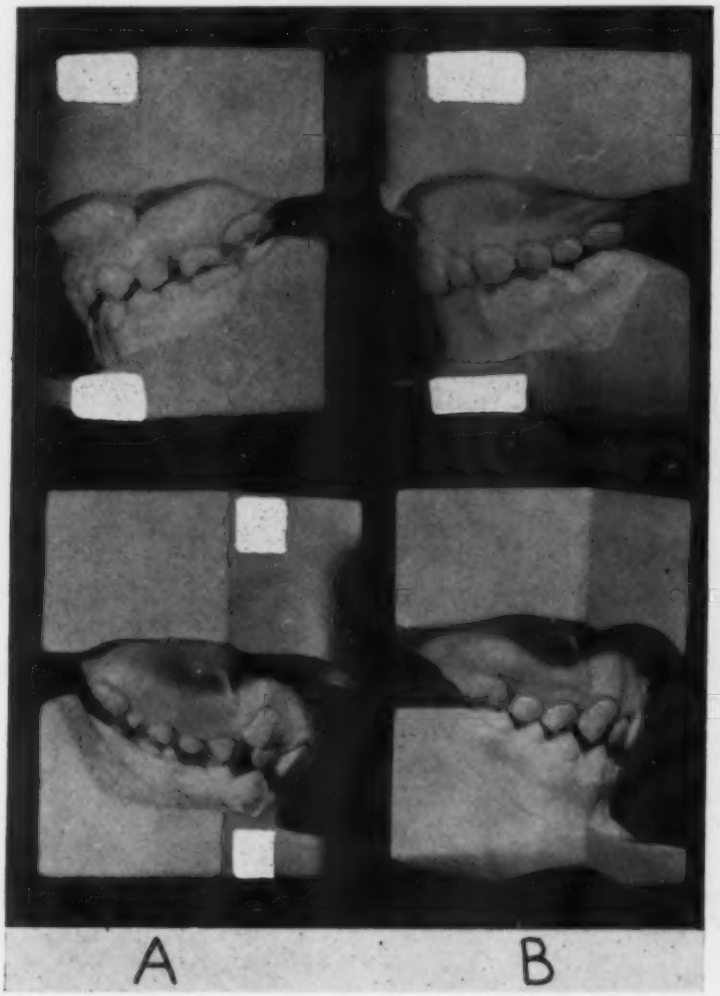


Fig. 3, *B*.—Shows right and left sides of casts shown in *A* (previous page), before orthodontic treatment (*A*) and after orthodontic treatment (*B*). Tooth alignment and correction of dental arch relationship as shown here are not possible in "extraction cases" without orthodontic intervention.

Seipel's investigations thus confirm the writer's[3] conclusions, previously presented, regarding the relationship of the trajectories of the jaws to orthodontic tooth movement.

The movement of teeth by orthodontic means does not modify the trajectorial system of the jaws and does not change the form of the basal arch, which

is an intrinsic part of the over-all morphology of the jawbone, even when the alveolar process itself which follows the teeth is changed as a result of orthodontic tooth movement. Furthermore, orthodontic tooth movement cannot alter the closed functional system of teeth, bones, and muscles.

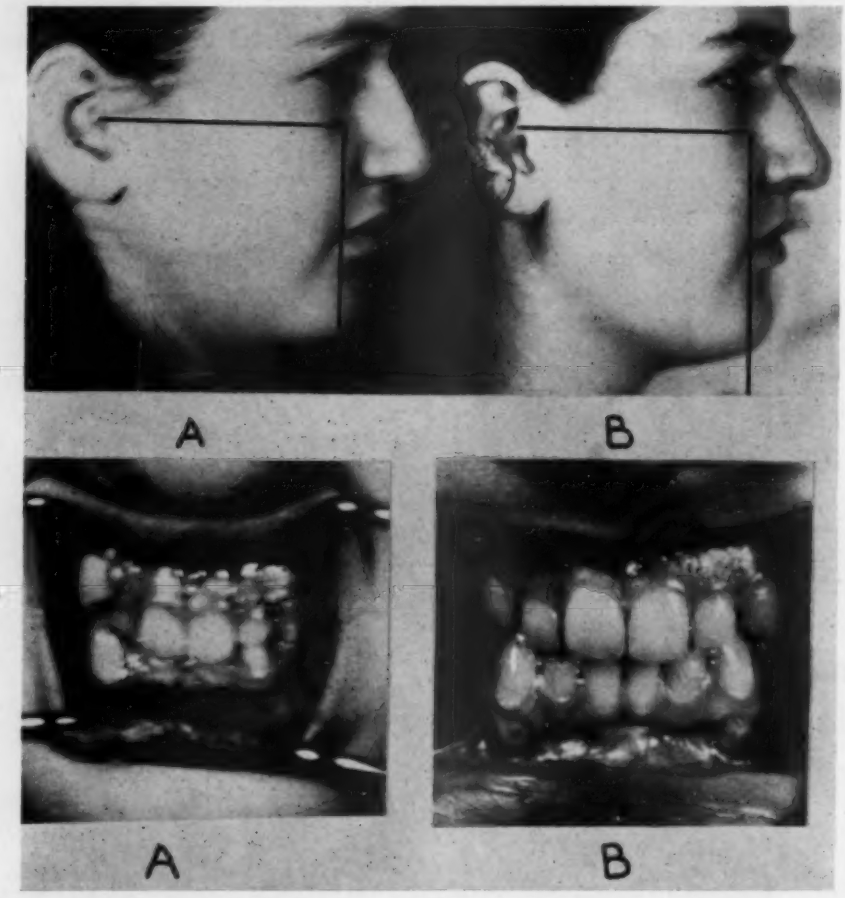


Fig. 3, *C*.—Profile and anterior views of teeth of patient shown in *A* and *B* (previous pages), before treatment (*A*) and after treatment (*B*).

Note: Improvement or maintenance of the profile appearance of the patient would not have been possible if the mesiodistal dimension of the coronal dental arch had not been reduced by extraction. In this case, as stated, the teeth extracted were the first molars, because of infection.

Moreover, orthodontic tooth movement which brings the teeth into conflict (a state of shear) with the closed functional system defined by the trajectories, the intrinsic lines of stress of the jaws, and the muscles of mastication results in relapse. In order to avoid placing the teeth in a shearing relationship to the closed functional system of the jaws, in the presence of crowding and/or alveolodental prognathism, the mesiodistal configuration of the dental arches has to be reduced and extraction of dental units is in order.[15]

THE LIMITATIONS OF EXTRACTION AS AN AID IN ORTHODONTIC THERAPY

Extraction as an aid in orthodontics has been advocated by many practitioners including Angle[16] in the sixth edition of his book, although he later

changed his mind, by Case,[17] Grieve,[18] and more recently by Tweed.[19] Angle pointed out that the bilateral extraction of dental units is indicated in certain types of Class I, Class II, and Class III (Angle) malocclusion cases. Extraction is indicated, according to Angle, where ". . . the angles of inclination would be too great if all the teeth were placed in line," and where ". . . the facial result be more unpleasing than if the teeth had been allowed to remain in malpositions." Tweed, basing his conclusion on clinical observation, definitely attributed "collapse" in certain cases of treated malocclusion to disproportion between tooth structure and what he calls "basal bone," which the writer feels actually refers to the same bone area termed by Bluntschli and Winkler the "basal arch."[8]

Many practitioners who have extracted teeth in the course of orthodontic treatment have been disappointed, however, in finding recrowding and space-opening after all retaining appliances were removed. These phenomena have been attributed by Tweed[20] to failure to place the incisor teeth over so-called "basal bone." While Tweed's contention is true in certain cases, it is not the only reason for recrowding of teeth and opening of spaces in so-called "extraction cases."

Many of the cases of recrowding of incisors and space opening, after orthodontic treatment which includes tooth extraction of first premolars or other teeth, can be attributed, in addition to the discrepancy between the mesiodistal dimension of the tooth crowns in the dental arch and size of the basal arch, to intrinsic and extrinsic forces which affect the human dentition. Among these are the method of chewing and swallowing; the type and degree of pressure when the teeth are brought into occlusion and dentofacial habits which involve the teeth, tongue, lips, and other facial and masticatory muscles; psychic disturbances which are accompanied by certain orofacial tics, and other untoward movements involving the teeth. All of the foregoing are important factors which interfere with the satisfactory results obtained in orthodontic treatment.

If more lasting results are to be expected in orthodontic practice, whether or not extraction is a part of treatment, practitioners of orthodontics will have to take into account the dentofacial complex of their patients, including their psychosomatic involvements which are frequently responsible for abnormal postural relationships of the jaws, leading to aberrant stresses on the dentition with a recurrence of malocclusion.

TRUE FACIAL PROGNATHISM AND DENTOALVEOLAR PROTRUSION

Facial prognathism, the presence of which is considered a prime etiologic factor in determining the desirability of extraction as an adjunct to orthodontic therapy, can in no way be attributed to the axial inclination of the incisor teeth alone. The facial profile is affected by the shape and size of the jaws, dentoalveolar protrusion, the axial inclination of the incisor teeth to the base of the mandible, the size of the gonion angle, the relationship of the mandibular dental arch to the prementon point, and the distribution and amount of the soft subcutaneous tissues covering the face. (Fig. 4 *A, B, C,* and *D.*)

Bjork[21] investigated the effects of variations in jaw growth on the mechanics of prognathism, as well as the relationship between facial build and occlusion.

He devised a facial diagram, the linear and angular configurations of which, he showed, determine the amount and distribution of facial prognathism (Fig. 5).

Bjork's facial diagram includes the following: a line drawn from the apex of the anterior *nasal spine* to *nasion*, to the center of *sella turcica*, to *articulare* (the point of intersection of the dorsal contour of the articular process of the

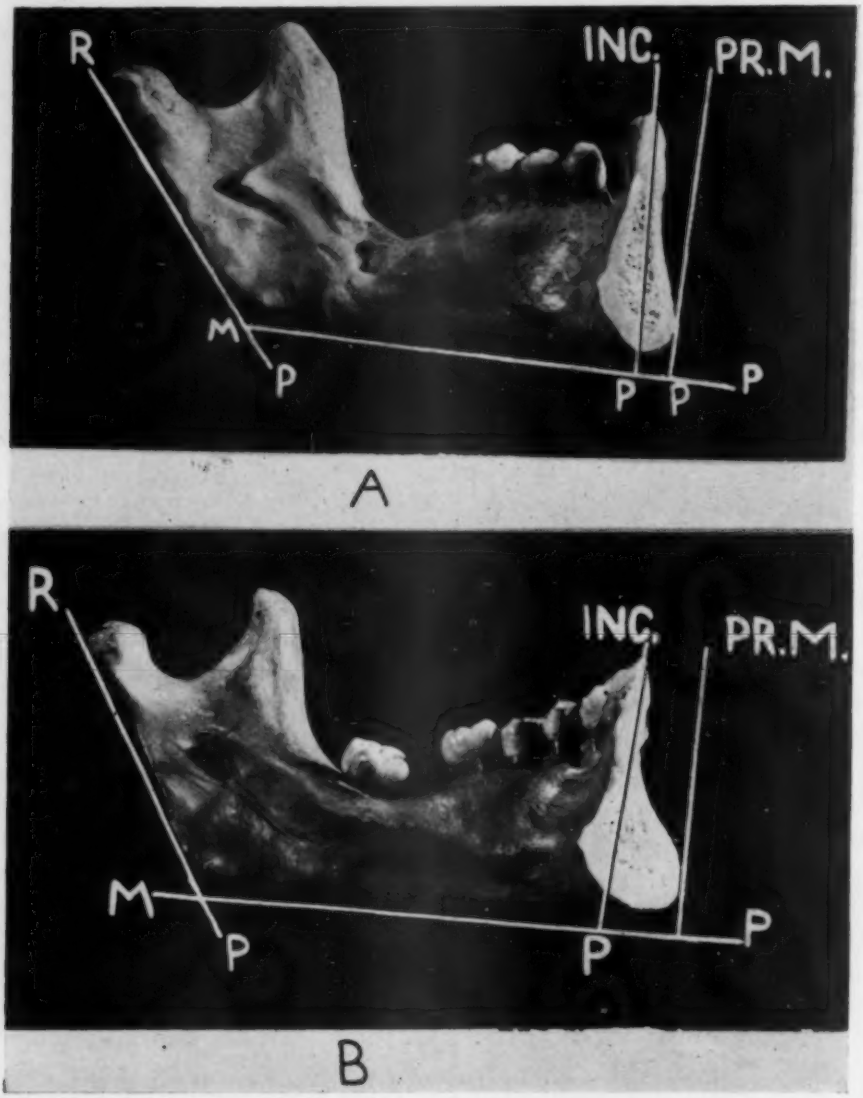


Fig. 4, *A*.—Cross section of the mandible (*A*), showing the incisor plane (*INC.-P.*) through the long axis of the central incisor in relation to the mandibular plane (*M.-P.*) and the prementon plane (*PR.M.-P.*), a line tangent to pogonion, the most prominent point on the chin and at right angles to the mandibular plane. The ramus plane (*R.-P.*) is tangent to the most distal point on the mandibular condyle and the most distal point on the ramus. The gonion angle is measured at the intersection of the planes *R.-P.* and *M.-P.* Note the difference in relationship of the incisor plane (*INC.-P.*) to the mandibular plane (*M.-P.*) and the prementon plane (*PR.M.-P.*) in mandible *A* in comparison to mandible *B*. (Dissection, courtesy of Dr. Harry H. Shapiro, Columbia University.)

Note: The gonion angle, the incisor plane in relation to the mandibular plane and the prementon plane, the arrangement of the teeth in the dental arches, the soft tissue covering of the facial skeleton, the facial profile, and the developmental age of the patient must be taken into consideration before the decision is made to extract teeth as part of orthodontic treatment.

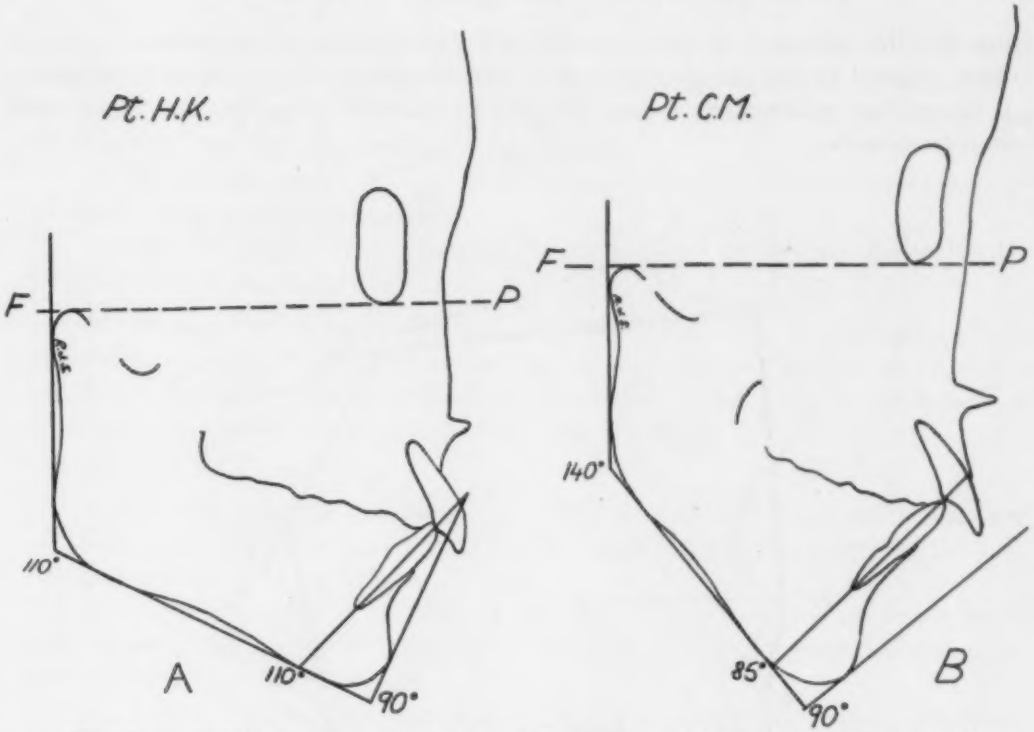


Fig. 4, *B*.—Outline drawings of profile roentgenograms, oriented along the Frankfort plane. Pt. H. K. (*A*) has a gonion angle of 110° and a procumbency of the mandibular incisors to the mandibular plane of 110°. The incisor teeth are close to the prementon plane which is tangent to the prementon point, indicating that the entire dental arch is situated in a comparatively forward position in relation to the base of the mandible. Pt. C. M. (*B*) has a gonion angle of 140° and the mandibular teeth are at 85° in relation to the mandibular plane. The mandibular incisors are comparatively more distal to the prementon plane which is tangent to the prementon point indicating that the entire dental arch is situated in comparatively more distal position in relation to the base of the mandible. In spite of the difference in the axial relationship of the mandibular incisors to the base of the mandible in each of the foregoing patients, the angular relationship of the incisors to the Frankfort plane is actually the same in both patients. The effect of the procumbency of the mandibular incisors in Pt. H. K. (*A*) is offset by the comparative acuteness of the gonion angle which is 110°, while in Pt. C. M., (*B*), the effect of the retrusion of the mandibular incisors is nullified by the comparative obtuseness of the gonion angle, 140°.

Fig. 4, *C*.—Profile photographs of Pt. H. K. and Pt. C. M., showing differences in facial outlines and in the degree of prognathism due mostly to differences in length of the mandibular ramus and the acuteness of the respective gonion angles. Incisor procumbency is not a factor in prognathism of the facial profile in these patients.

mandibular condyle and the temporal bone), to the point of intersection between lines tangent to the ramus and base of the mandible, to a point of intersection between lines tangent to the base of the mandible and *prognion*, and from there to *infradentale*.

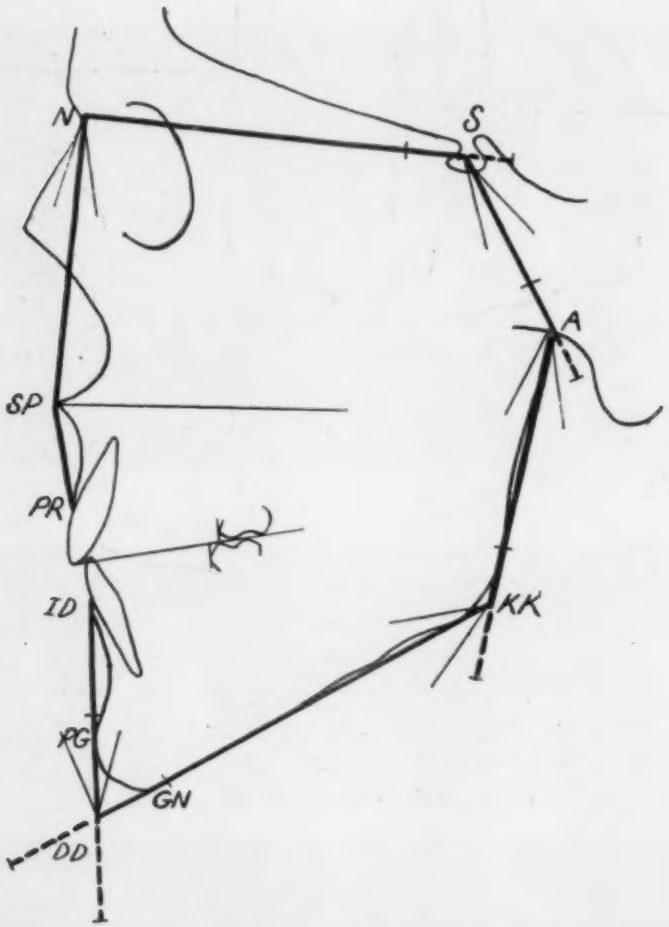


Fig. 5.—Bjork's facial diagram. *N*, nasion, the midpoint on the frontonasal suture; *S*, sella turcica, the midpoint on the horizontal diameter of the sella turcica; *A*, articulare, the point of intersection of the dorsal contour of the mandibular condyle and the temporal bone, as seen on the profile roentgenogram; *KK*, gonion point, the point of intersection between tangents to the base and ramus of the mandible. *DD*, chin-point, the point of intersection between a line tangent to the base of the mandible and a line tangent to *ID*, *infradentale*, and *PG*, *pogonion*, the most prominent point on the chin, *GN*, the lowest and most inward point on the chin. *PR*, prosthion, the lowest point on the interdental alveolar process. *SP*, spinal point, the apex of the anterior nasal spine. (Redrawn after Bjork.)

Change in any of the angles or lines of the facial diagram devised by Bjork produces the following effects on facial prognathism.

A. *Angular Changes.*—

1. *Sella turcica:* Reduction of the angle at *sella turcica* causes forward displacement of the temporomandibular joint with the secondary effect of forward displacement of the jaws, accompanied by an increase in prognathism of the facial profile.

2. *Articulare:* Reduction of the angle at *articulare* increases the degree of prognathism with the secondary effect of shortening the height of the upper part of the face, bringing the base of the mandible more parallel with the base of the skull and increasing mandibular prognathism.

3. *The gonion angle:* Reduction of the *gonion angle* does not increase prognathism and may actually reduce it.

4. *The chin angle:* Reduction at the chin angle will reduce dentoalveolar prognathism of the mandible.

When mandibular first premolars are extracted and the procumbency of the mandibular incisors in relation to the base of the mandible is eliminated, while the first premolar spaces are closed, alveolodental prognathism of the mandible is reduced because of the reduction of the chin angle.

B. *Linear Changes.*—

1. Shortening of the line *nasion* to *sella turcica,* when the other lines are constant, produces pronounced increase in prognathism if the length of the face remains unaltered.

2. Shortening of the line from *sella turcica* to *articulare* increases prognathism with the secondary effect of shortening face height, provided the angle at *articulare* remains unchanged.

3. *Increase* in the line from *articulare* to K (the *gonion angle*) increases mandibular prognathism. However, if the ramus is parallel with the facial profile, there is no increase in prognathism.

4. Increase in length of K (gonion angle) to *dd* (the chin angle) produces a pronounced increase in facial prognathism.

5. Increase in facial height produces a slight increase in prognathism.

True facial prognathism may be summarized, according to Bjork, as being due to the reduction of the angle at *sella turcica* or at *articulare,* to an increase of the angle at the chin, shortening of the cranial base, or to an increase in the length of the body of the mandible.

Orthodontic therapy, in view of the foregoing, is of no avail in attempts to change facial prognathism, except when it is attributable to alveolodental prognathism. In the latter case, extraction, preferably of first premolars, makes possible the distal and lingual positioning of the teeth anterior to the extraction space, and a reduction of the procumbency of the incisors. The net result is a reduction of the chin angle with a consequent reduction of alveolodental prognathism.

Bjork found no difference in the inclination of the mandibular incisors in crowded dental arches when compared to arches with teeth in regular alignment. However, Bjork[21] and Seipel,[22] found more crowding in shorter jaws.

The percentage of increase in height of the lower jaw was found by Bjork to be greater than that of the upper jaw, while the percentage of increase in the posterior part of the face was found to be relatively and absolutely greater than in the anterior part of the face. Bjork concluded that the relative increase in mandibular prognathism is due to the greater increase in the height of the ramus, since the gonion angle remains constant.

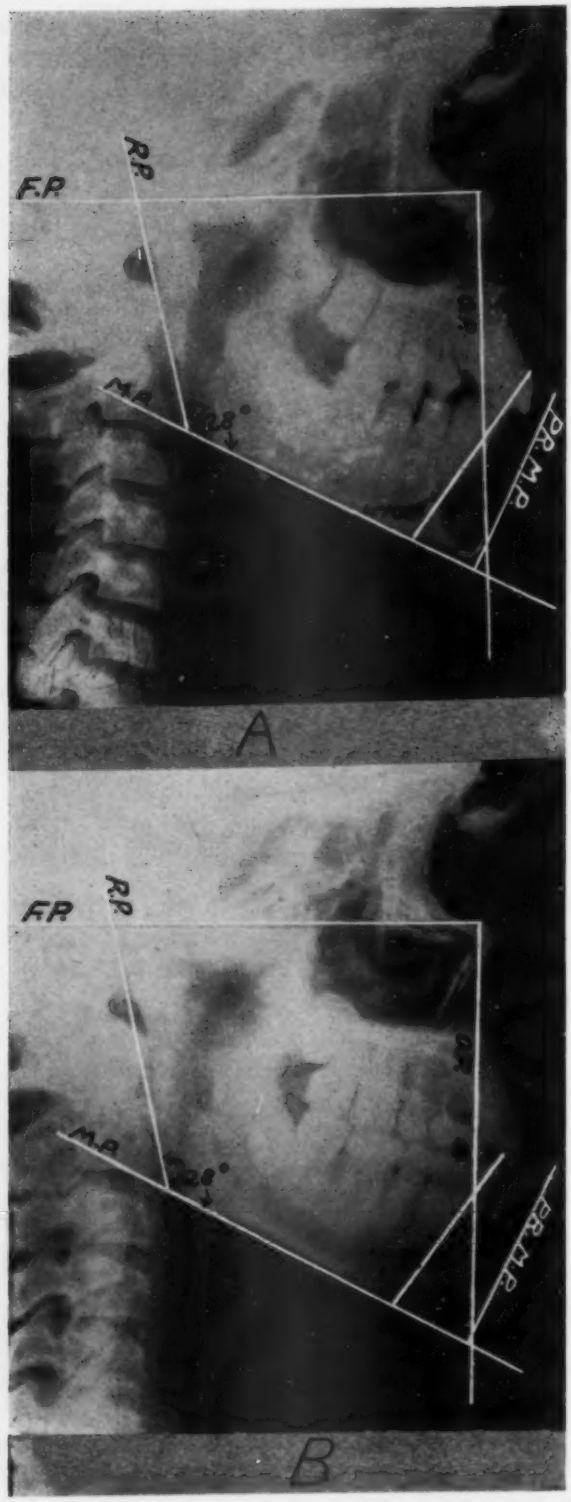


Fig. 6.—*A*, Profile roentgenograms before treatment (*A*) at age 11, and sometime after treatment (*B*) at age 15. Note that procumbency of the incisors is maintained at 100°. The gonion angle is constant at 128°.

While the dental arches move forward in relation to *orbitale* as facial growth proceeds, Bjork found that they do not move forward in their relationship to the basal portions of the jaw themselves.[23] Forward relation of the basal portions of the jaws is in fact greater than alveolar and dental forward growth

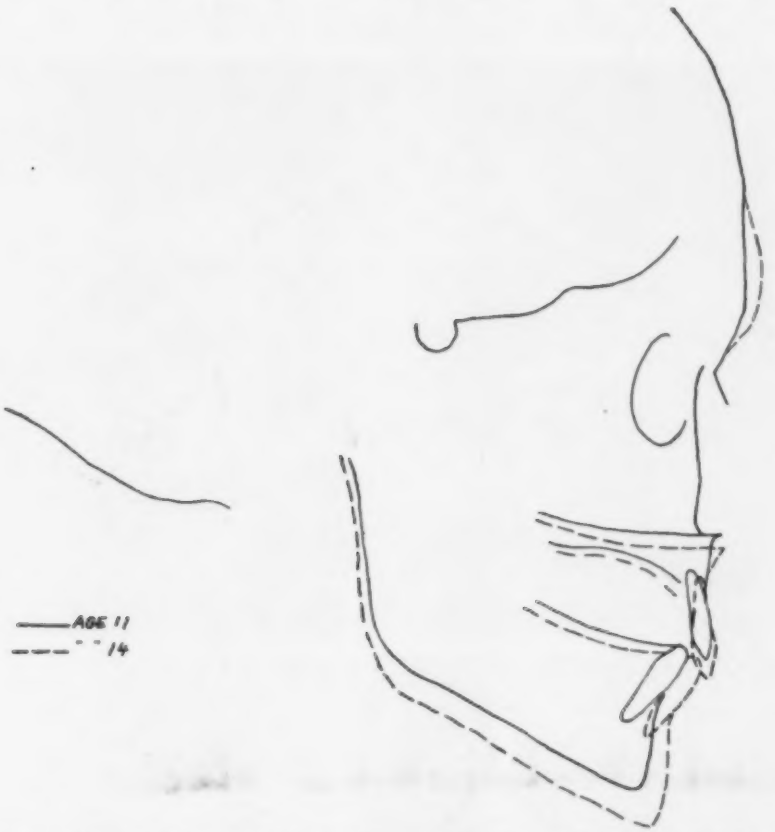


Fig. 6, *B*.—Diagram shows superimposed roentgenograms. The solid lines indicate the profile at age 11, and the broken lines indicate the profile at age 15. This diagram shows the forward and downward growth of the lower portion of the maxillary bone and of the mandible.

since the angular relationship of the incisor teeth, i.e., the procumbency of the incisors, is automatically reduced with age, between 12 years and 21 to 22 years, with a consequent straightening of the facial profile. Goldstein[24] (1936) observed a similar change. The chin angle, therefore, becomes smaller as the jaw grows forward between 12 and 21 to 22 years of age, with a resulting self-improvement of the facial profile to varying extent. (Fig. 6, *A*, *B*, *C*, and *D*.)

This is the only significant angular change in the facial diagram noted by Bjork. It is a developmental change which is brought about by growth and maturity. Furthermore, as the writer pointed out previously, it is also the only change which can be effected by the measures available to orthodontics, in attempts to reduce facial prognathism.

In the light of these findings, it is hazardous to establish a diagnosis of procumbency of incisor teeth and alveolodental prognathism and to extract teeth on the basis of such a diagnosis until all facial growth is virtually completed. Furthermore, extraction of teeth in the presence of true maxillary and/or man-

dibular prognathism, without dentoalveolar prognathism, is of little or no avail in the attempt to reduce prognathism of the facial profile.

VARIATION OF BASAL ARCH SIZE AND DENTAL ARCH RELATIONSHIP

Many children show basal arches of different size in the maxilla and in the

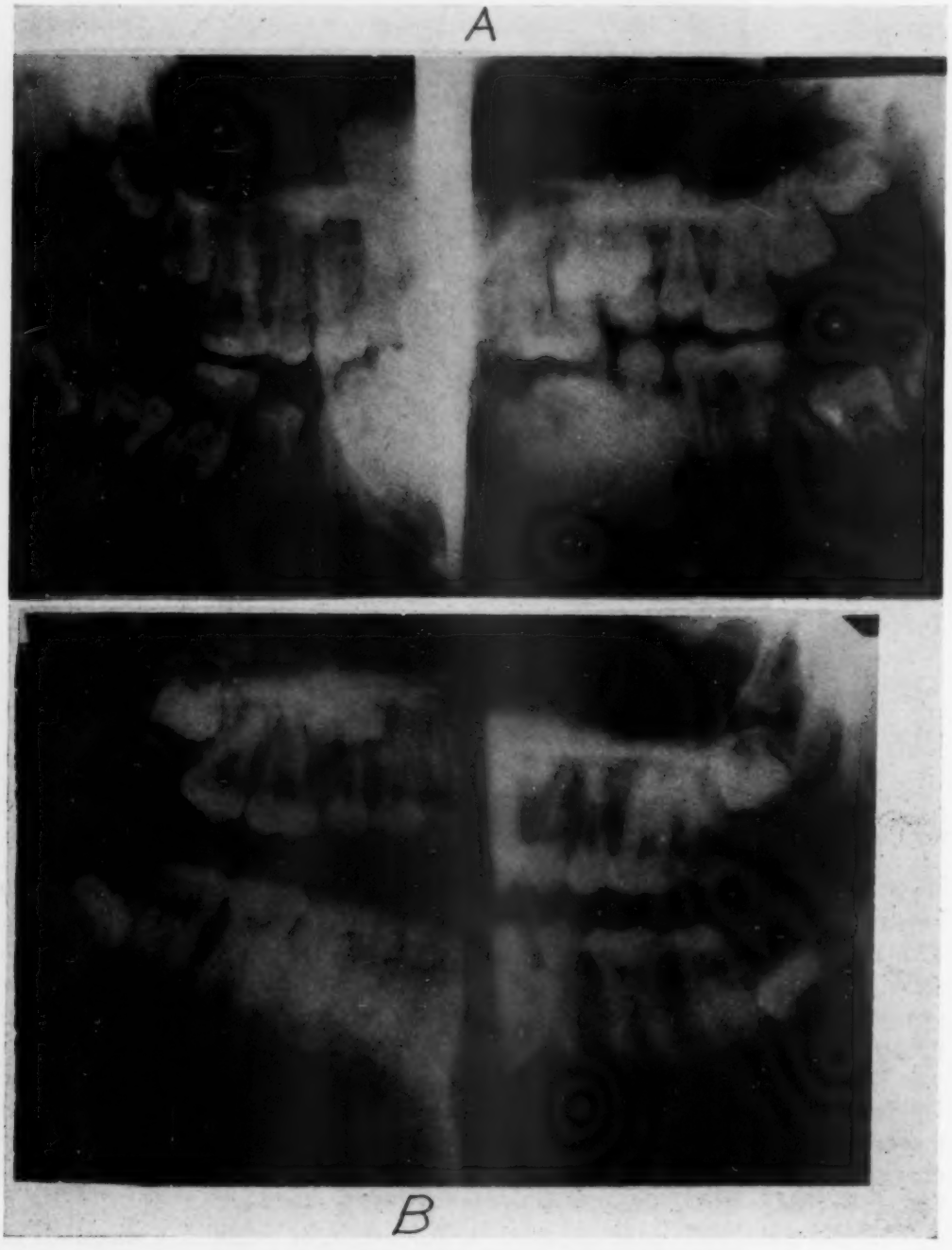


Fig. 6, *C*.—The incisors were not crowded although lateral jaw plate (*A* and *B*, *A*) at age 11 shows apparent lack of space for molar teeth. Lateral jaw plate (*A* and *B*, *B*) sometime after treatment was completed, at age 15, shows second molars in position and ample space for eruption of the third molars. There was no extraction of any of the teeth to decrease mandibular incisor procumbency.

mandible (Fig. 7). In the case shown (Fig. 8), extraction of the maxillary first premolars was performed by a general practitioner in his attempt to bring the maxillary canines into position. A view of the profile of this patient will show that there is a prominence of the mandible and a flat appearance of the middle third of the face. The profile roentgenogram of the mandible shows the mandibular teeth to be at an angle of 90° to the base of the mandible and in good alignment. The effect of the extraction was to produce a pseudo Class III (Angle) malocclusion.[25]

In true Class III malocclusion, when the incisor teeth are not crowded and are in lingual inclination to the mandibular base and the basal arch is of ample proportion as indicated by the absence of the inverted simian shelf, extraction as part of orthodontic therapy is followed by space opening (Fig. 9).

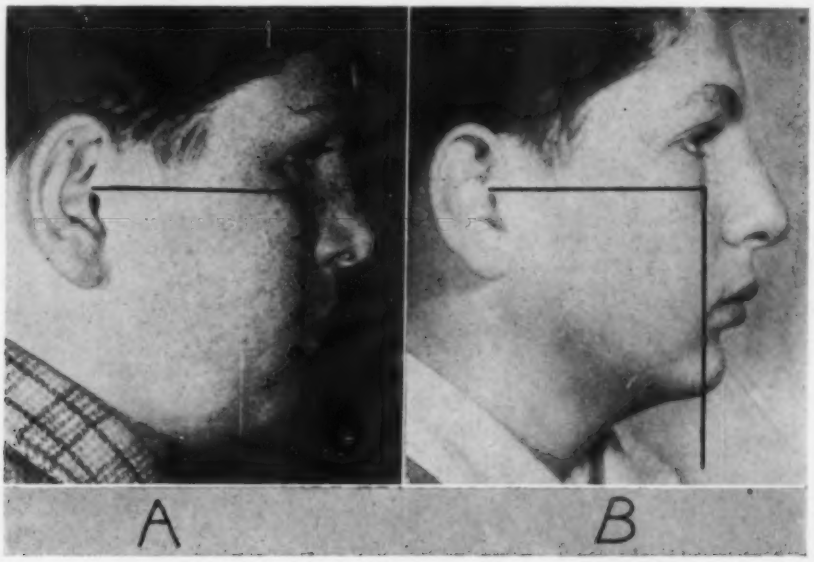


Fig. 6, *D*.—Profile photographs indicate forward and downward growth of the mandible. *Note:* The thick musculature at the *orbicularis oris*, especially of the upper lip, tends to emphasize alveolodental procumbency present. Normal occlusion is being maintained although there were no premolars extracted in this case. Presence of procumbency of mandibular incisors in itself is not a reason for extraction of teeth as an adjunct to orthodontic mechanotherapy.

A deficiency of the basal arch can exist with the teeth in normal alignment. In these cases, the incisor teeth are in procumbent relation to the mandibular plane. Extraction in these cases depends on the degree of facial prognathism manifested in the profile of the patient. If the dental arch is situated far enough in a *linguad* direction so that the existing procumbency of incisor teeth does not produce facial prognathism, while the *gonion angle* is less than 125° and the ramus of the mandible is fairly long so that the base of the mandible approaches a state of parallelism with the Frankfort plane, extraction becomes an objective, if not an arbitrary procedure.

When there is crowding of teeth with or without procumbency of the mandibular incisors and the basal arch is constricted, extraction is indicated. Attempts to "round out" the dental arch in these cases result in the positioning of the incisors and other teeth in conflict with the trajectories or inherent lines

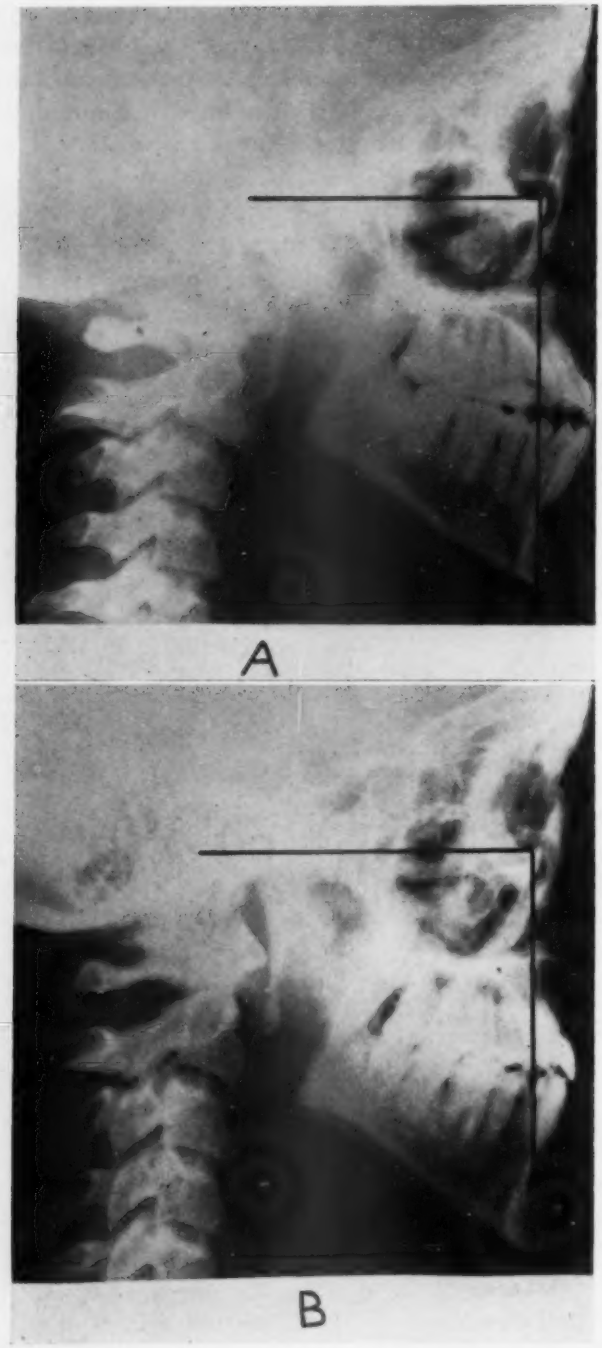


Fig. 7.—Class III (Angle) tendency. There is a constricted basal arch in the maxilla (*A*) as indicated by the axial angles of the maxillary anterior teeth. Roentgenogram (*B*) shows elimination of the Class III tendency. The mandibular first premolars were extracted and the mandibular incisors were moved lingually and the canines distally. In this case, the mandibular incisors were slightly procumbent.

of stress of the jaws and with the closed functional system. After the orthodontic appliances are removed, these stresses re-establish the state of equilibrium in malocclusion in their attempt to eliminate the shearing forces exerted by the orthodontically moved teeth, and relapse results. (Fig. 10, *A*, *B*, and *C;* Fig. 11, *A* and *B*.)

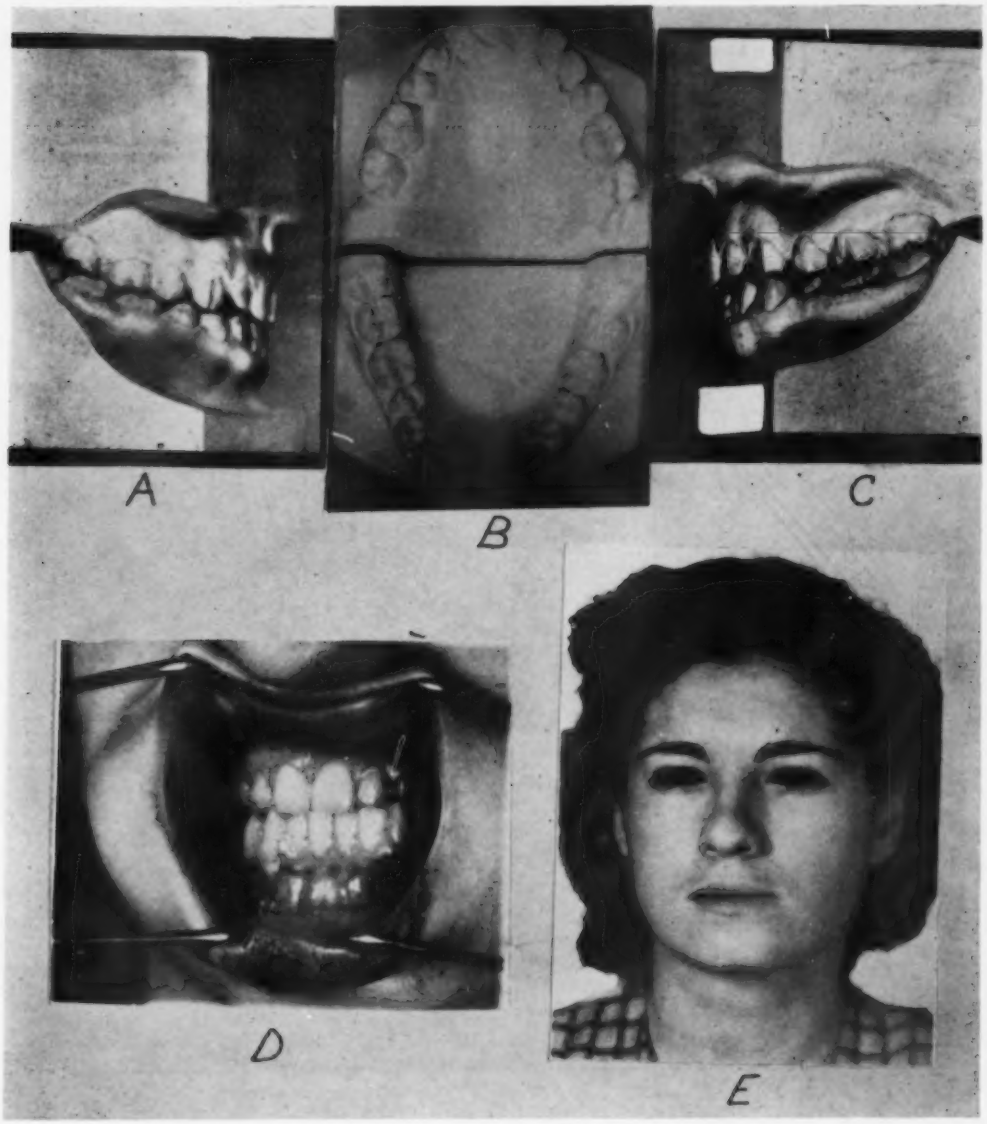


Fig. 8.—Casts and photographs of patient, aged 18 years, when first seen. The maxillary first premolars had been extracted and the canines which were blocked out of the arch had been brought into alignment in the first premolar spaces. Lingual collapse of the maxillary arch followed with a flattening of the maxillary portion of the face, a tendency to Class III (Angle) malocclusion, and mandibular prominence. Adequacy of the basal arches had been ignored, and the extractions were performed to aid in overcoming tooth crowding without regard to basal arch growth, facial appearance, and interdental arch relationship.

RELATIONSHIP OF SOFT TISSUES TO FACIAL APPEARANCE

Facial appearance is influenced by the soft tissues even more than by the relationship of the underlying bones, the occlusion, and the axial positions of the teeth. M. F. Ashley Montagu pointed out that there is no positive correlation between the underlying bones of the facial skeleton and the size and form of the lips, the shape of the nose, distribution of subcutaneous fat, and other soft tissue characters of the face. Attempts to reconstruct or draw the

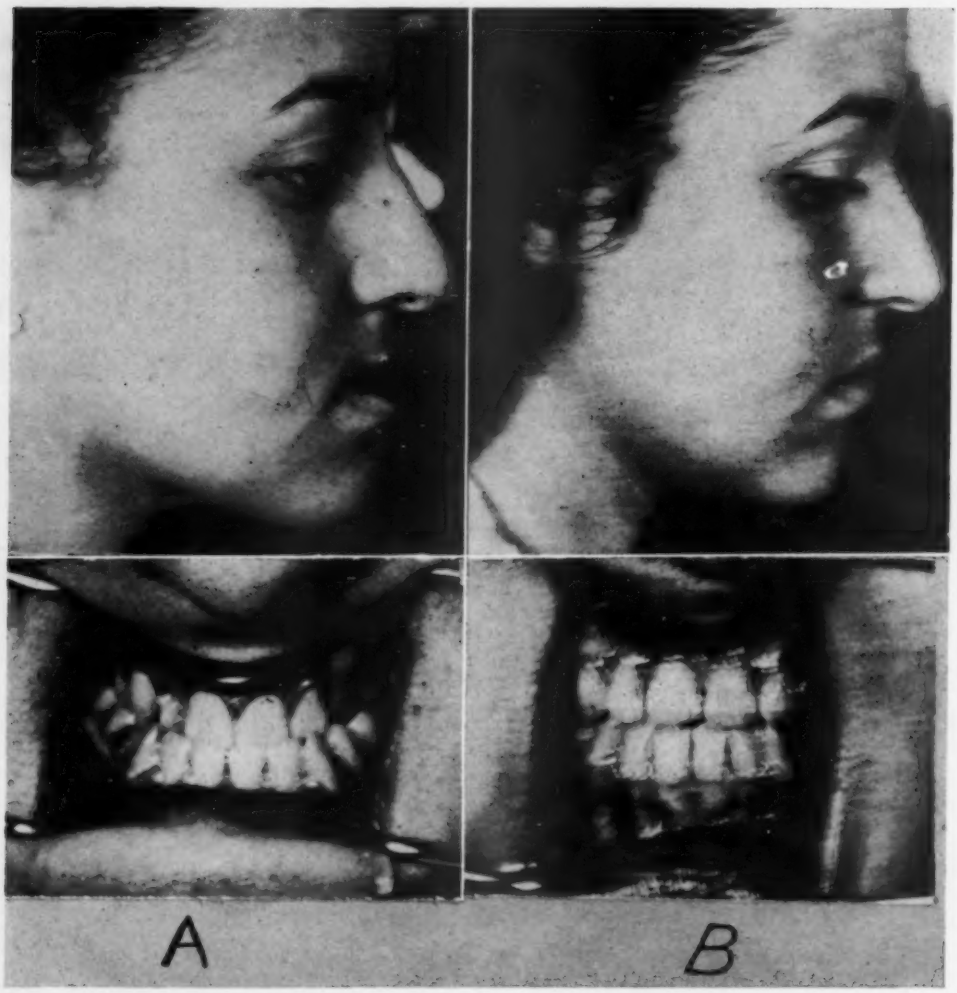


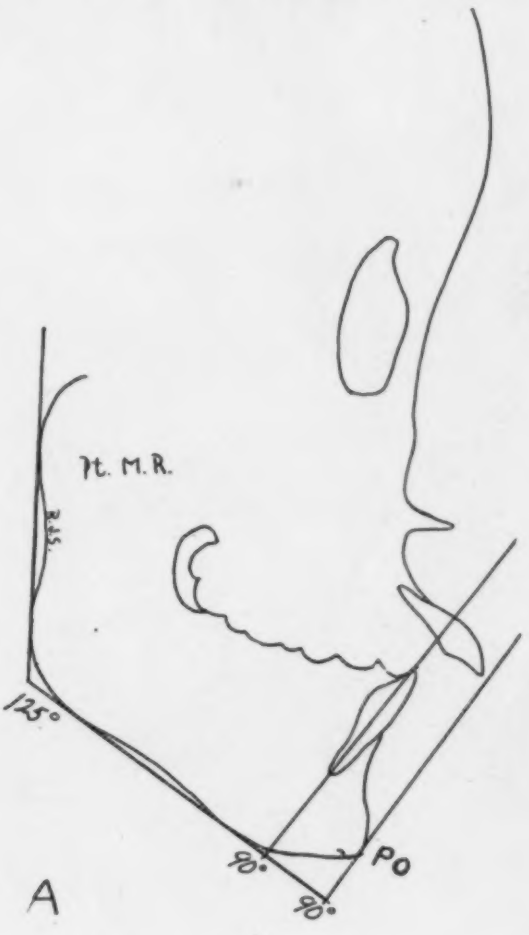
Fig. 9.—Profile photograph of patient (*A*) with Class III (Angle) malocclusion. Profile photograph (*B*), same patient after treatment.

Note: The large basal arch in the true Class III (Angle) mandible, where the incisors and other teeth are in lingual axial relation to the mandibular plane, makes the practice of extraction as an adjunct in orthodontic therapy of questionable value, since there is a tendency to space opening in these cases. Successful treatment in the permanent dentition is accomplished by bodily distal positioning of the mandible or by increasing the degree of axial inclination of the maxillary incisors, a forward and outward movement of the maxillary teeth, bringing the incisal edges of the maxillary incisors labial to the mandibular incisor, or a combination of the foregoing.

appearance of the face on the basis of skeletal remains lie in the realm of pure conjecture (Fig. 12).

In the case shown, the arrangement of the teeth of the patient and the relationship of the jaws themselves were not changed orthodontically or otherwise. The facial profile in its entirety was improved by rhinoplasty alone. This improvement is due directly to changes in cutaneous and muscular tension and has nothing to do with the position of the teeth or with the relationship of the jaws. (Fig. 14.)

The foregoing must be taken into consideration by those who undertake to reduce facial prognathism by changing the occlusion of the teeth, regardless of the fact that extraction of teeth may or may not be resorted to as part of treatment. The appearance of the face is only partially influenced by the morphology



A.

Fig. 10.—Diagram (*A*) of profile roentgenogram of Pt. M. R., aged 14. Gonion angle 125°, the entire mandibular dental arch is situated well *linguad* to the plane tangent to the prementon point (pogonion) (*PO*). There is no incisor procumbency shown in the roentgenographic profile (*B*), shown with the photograph of the patient before treatment. The anterior view of the dentition shows the mandibular canines totally and the mandibular first premolars partially crowded out of the dental arch. The maxillary and mandibular first premolars were extracted. Profile roentgenogram (*C*) is shown with profile photograph and anterior view of the teeth after treatment.

Note: Large teeth and extreme crowding of dental arches did not permit total elimination of mandibular incisor procumbency even after extraction of the four first premolars because of extreme crowding.

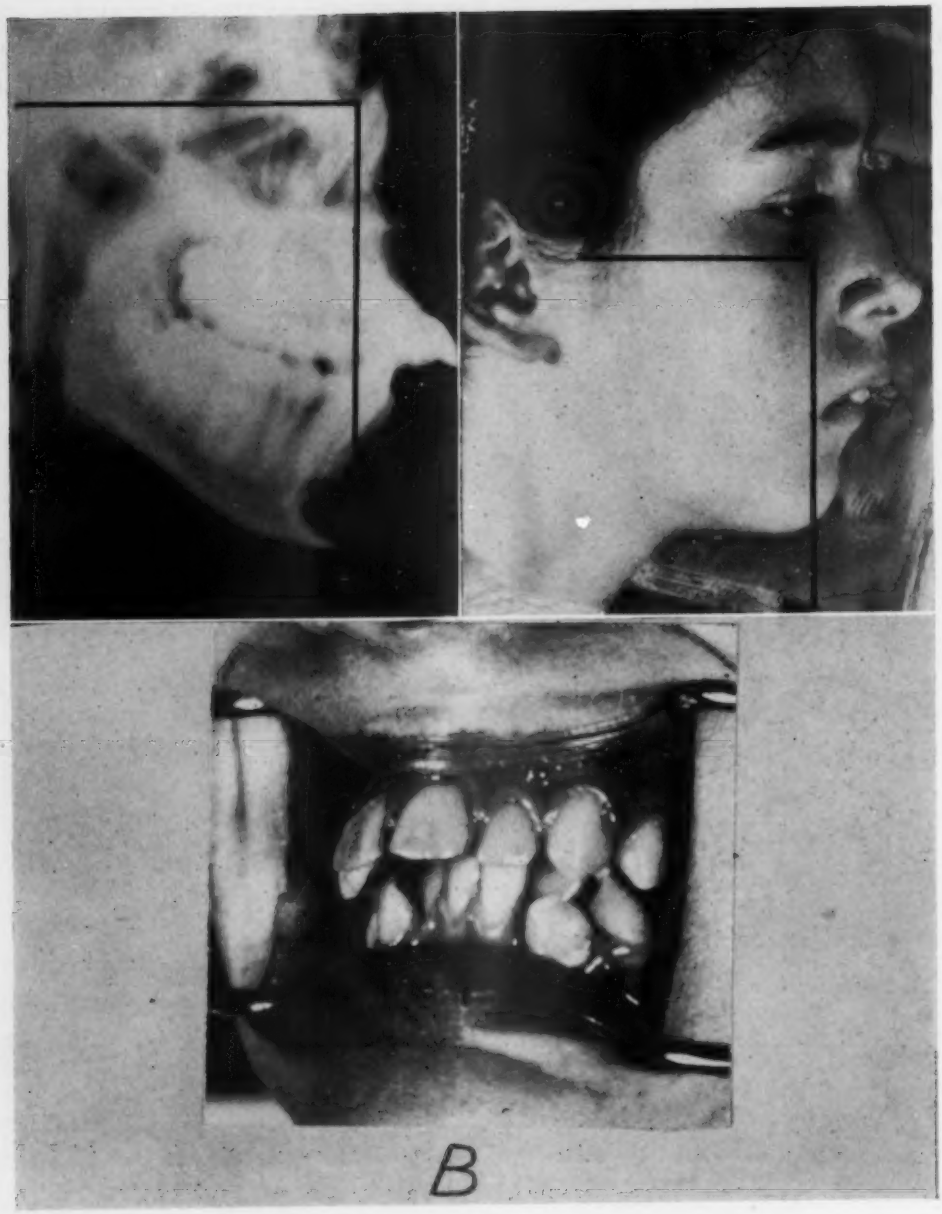


Fig. 10.—*B* (*For legend, see page* 603).

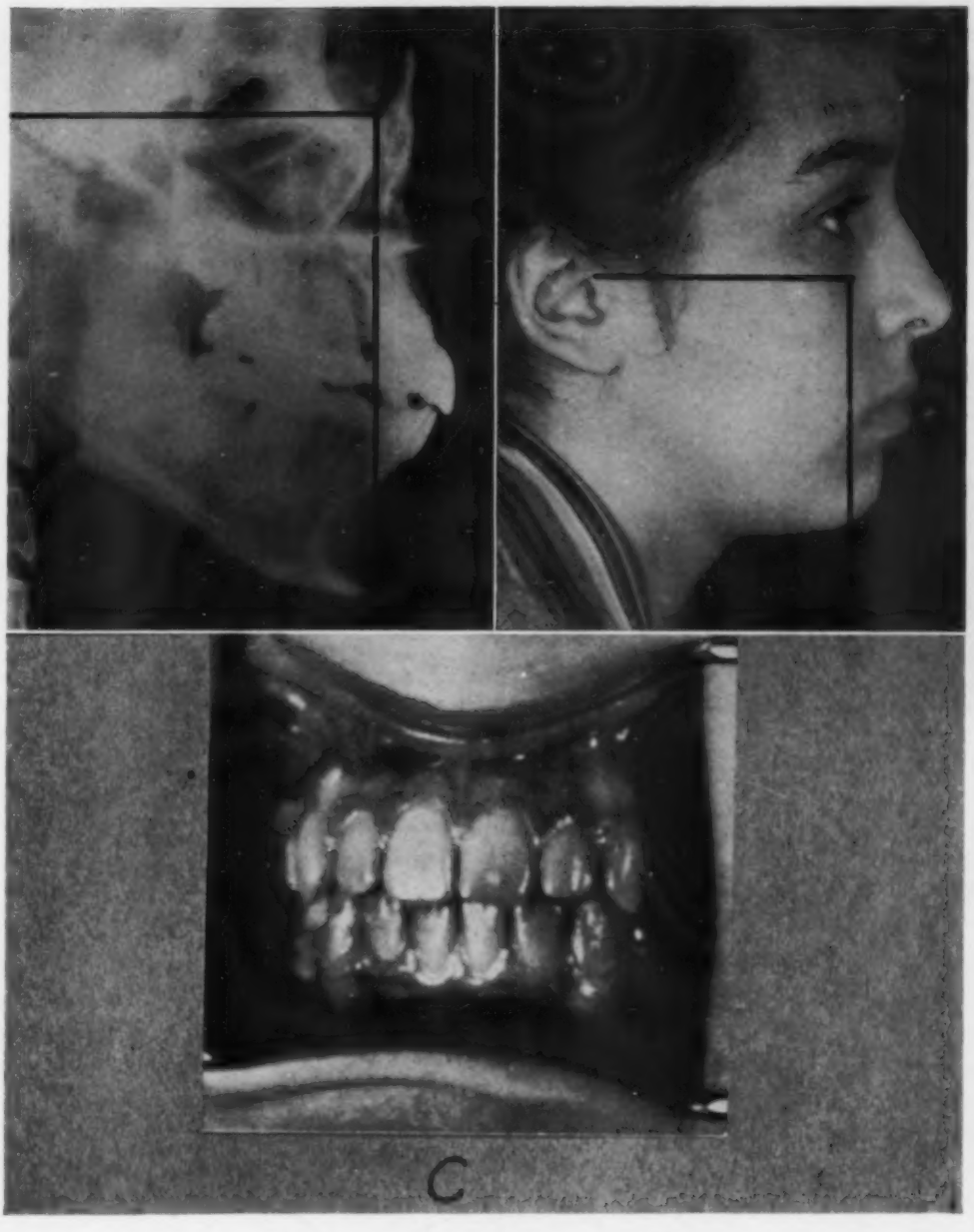
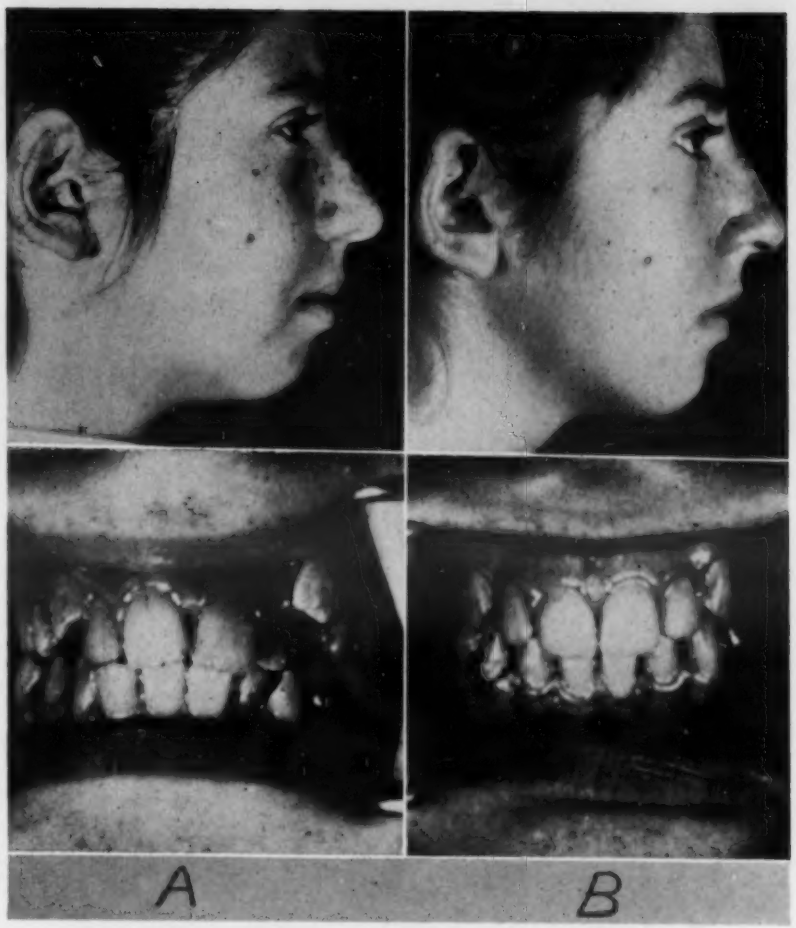


Fig. 10.—*C* (*For legend, see page* 603).

A.



B.

Fig. 11.—*A*, Diagram of profile roentgenogram, showing gonion angle of 140°; the mandibular incisors show a procumbency of 105°; the entire mandibular arch is in forward relationship to the mandibular plane.
B, Profile photographs showing patient before treatment (*A*) and after treatment (*B*), which included extraction of the four first premolars.

of the facial skeleton and the relationship of the jaws and teeth. The muscles, skin, and other soft tissues play an important part in the establishment of facial contours, including facial prognathism.

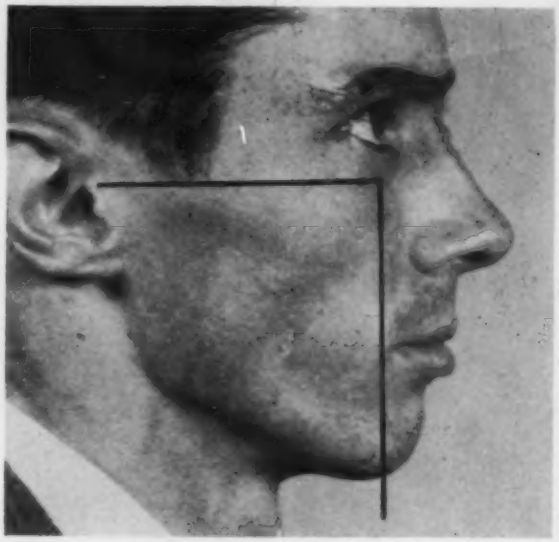


Fig. 12.—Profile view of a patient with bimaxillary protrusion. Orbital plane falls distal to the first premolar. However, the scant musculature and tight overlying soft tissues reduce the appearance of the bimaxillary protrusion.

PROCUMBENCY OF MANDIBULAR INCISORS AS A CRITERION FOR EXTRACTION

Procumbency of the mandibular incisor teeth in itself is not to be accepted as a sole criterion for extraction. It is frequently a minor factor only. There are other important associative factors. It is possible to have procumbency of the mandibular incisor teeth when facial and masticatory muscles are underdeveloped or of poor tonicity while the tongue is large and vigorous. Furthermore, when the ramus of the mandible is short, the incisor teeth may appear to be in procumbency when they are actually not at all procumbent. (See Fig. 4, *B* and *C*.)

The entire mandibular arch is frequently situated linguad to the body and base of the mandible with the prementon or chinpoint lying in a decidedly forward relationship to the labial surface of the incisors. Contrarily, in other mandibles the dental arch and its alveolar process may be situated in a more buccolabiad relation to the body and base of the mandible so that the prementon point lies almost on the same vertical plane with the labial surface of the incisors. Both types of jaws may or may not have a deficiency of the basal arch with or without crowding of the anterior and/or posterior teeth.

The relationship of the entire mandibular dental arch to the base of the body of the mandible is an important factor in determining the need for extraction where facial esthetics are the prime consideration. When the mandibular dental arch is decidedly linguad to the prementon point and the gonion angle is good, 125° or less, procumbency of the incisor teeth becomes a minor factor in facial prognathism. The size of the gonion angle, labiad-linguad position of the mandibular arch, and the relationship of the incisor teeth to the pre-

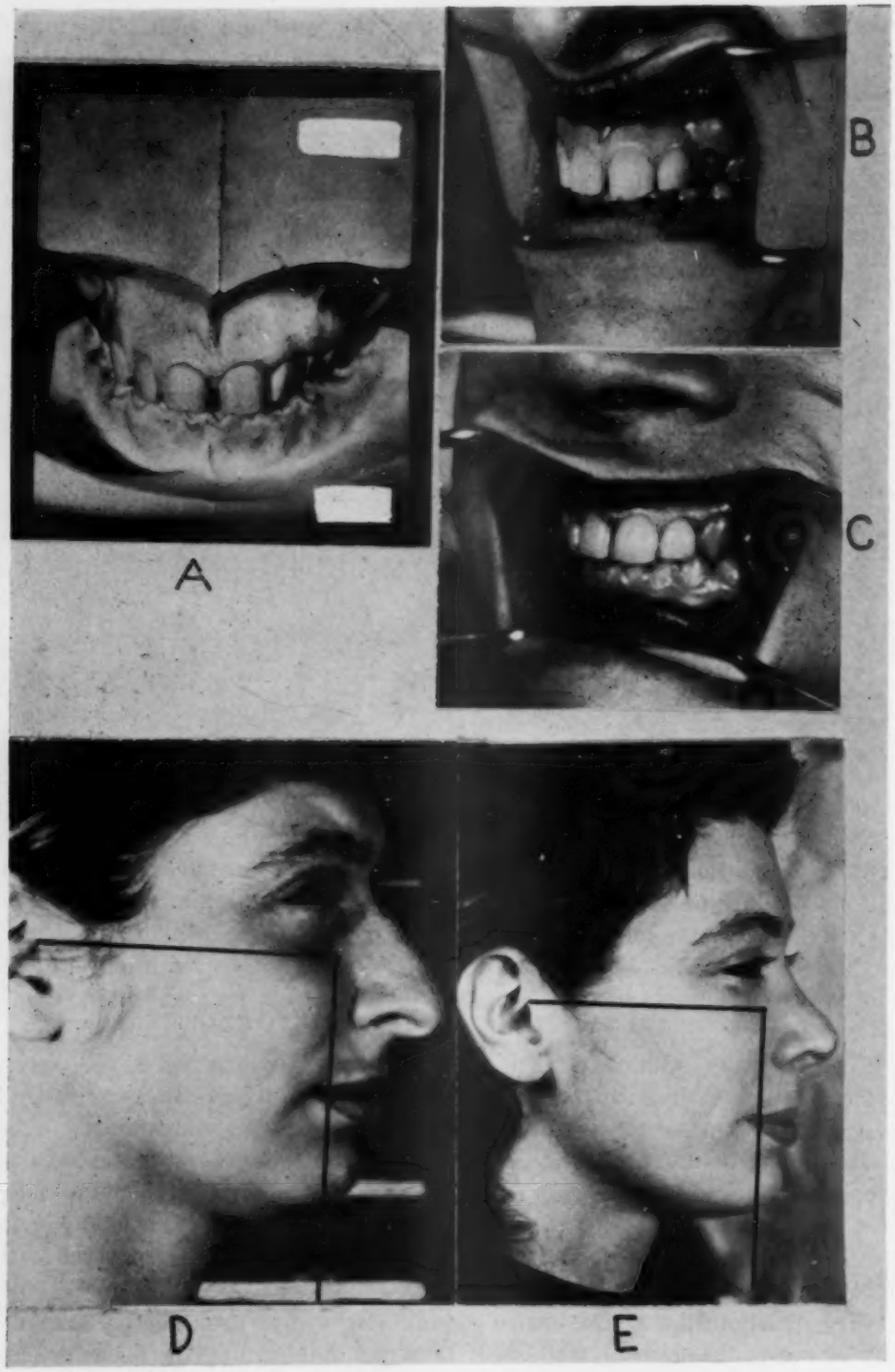


Fig. 13.—Cast (*A*) shows separation of the incisors and overbite. *B* shows presence of a carious deciduous canine. *C* shows occlusion after spacing between central incisor was eliminated and permanent canine was brought into position. There was no mesiodistal interarch correction and no appliance was ever worn on the mandibular arch. *D*, shows profile of patient before rhinoplasty, and *E*, after rhinoplasty. The rhinoplastic operation effected a change in the entire facial profile.

menton point can thus be seen to be more important factors in determining the need for extraction as a method of reducing facial prognathism than is incisor procumbency alone.

Fig. 14.—Profile of patient before rhinoplasty (*A*) and after rhinoplasty (*B*). Note change in entire facial profile although the patient never received orthodontic treatment. The change in soft tissue tension was responsible for the change in profile. (Courtesy, Dr. Adolph N. Abraham, New York, N. Y.)

SUMMARY

The factors in the dentofacial complex which constitute criteria for extraction in individual patients may be summarized as follows:

1. The labiad-linguad dental arch relationship to the prementon point.
2. The size of the gonion angle.
3. The axial inclination and the relationship of the mandibular incisors to a plane which passes through the prementon point and is perpendicular to the mandibular plane.
4. The type and degree of irregularity and crowding present in the dental arches before orthodontic treatment is undertaken.
5. The presence of constriction of the basal arches in relation to the dental arches.
6. The relative difference in size of the basal arches.
7. The amount and distribution of the soft tissues covering the facial bones.

Note: The angle at *gonion* is obtained on the profile roentgenogram by drawing a line tangent to the postcondylar point and the most distal point on the ramus of the mandible, and another line tangent to the most dependent points on the base of the mandible *(the mandibular plane)*. The relationship of the incisor teeth to the *prementon* point is obtained by drawing a line at right angles to the *mandibular plane* and tangent to the *prementon* point. The axial relationship of the mandibular incisors to the *mandibular plane* is obtained by drawing a line through the incisal edge and apex of one of the central incisors, inter-

secting the *mandibular plane*. The central incisor chosen should be one whose axial inclination to the *mandibular plane* is typical of the incisors being measured.

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PROPHYLACTIC ORTHODONTICS

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TO ANYONE who reviews the dental literature of the past ten years, it is immediately apparent that the majority of articles about orthodontics appearing in the journals from then until now have been written on the subjects of diagnosis and treatment of malocclusion. The etiology and prevention of dentofacial abnormalities are subjects which have found their way into orthodontic papers in comparatively few instances. This fact is regrettable. We know that many general practitioners are ignorant of the manifold opportunities that are afforded them to prevent malocclusion. If they were better informed of the simple, yet effective methods that can often be used, a greater number of dentofacial anomalies would be prevented by the more widespread application of prophylactic procedures. More papers should be written about aspect of practice. Prophylactic orthodontics deserves better publicity than it has received.

An etymological analysis of the word *prophylactic* reveals that it comes from the Greek verb *prophylaktikos,* meaning *to guard against.* Prophylactic orthodontics may be defined as the application or practice of those measures or principles which may be effective in guarding the individual against the development of oral and dentofacial anomalies. In its practice, various techniques are employed to intercept or prevent malocclusion. In brief, prophylactic orthodontics is synonymous with preventive orthodontics.

There are some observers who take a skeptical attitude toward the efficacy of preventive orthodontic procedures. These men contend that as our information about the causes of dentofacial abnormalities and malocclusion grows, they are more and more impressed with the role that the developmental or general factors (such as genetic, congenital, nurtural, metabolic, and endocrinal) play in the etiological picture, and give less and less attention to the nondevelopmental or local factors (such as oral habits, early loss of primary teeth, and improper dental restorations). This group argues further that because of the very nature of these general factors and the limited information we have concerning their modus operandi, it is very difficult and seldom practical to apply prophylactic measures that are able to thwart their action effectively.

We take no issue with the statement that a large percentage of malocclusion is caused by unknown factors, or by ones that are, for the most part, beyond our control. We do not believe, however, that efforts to apply prophylactic measures to intercept the effects of either local or general factors should be

Presented in partial fulfillment of the requirements for certification by the American Board of Orthodontics; read at the meeting of the American Asscciation of Orthodontists, New York, N. Y., May, 1949.

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belittled or discouraged simply because such measures may not be applicable in the majority of cases.

It is our premise that a significant amount of malocclusion can be intercepted and prevented or the etiological factors rendered so impotent that the subsequent corrective treatment is made a minor rather than a major problem. There are statements in the literature that will support this. Moore[1] says, "A fair percentage of the cases of malocclusion now being treated could have been diminished in severity, checked at the start, or prevented outright." Brandhorst,[2] reporting on a survey of over 100,000 St. Louis school children, found more than one-half with dentofacial abnormalities, and of that group 81 per cent could have been prevented. Higley[3] believes that serious dentofacial deformities can be minimized if the dentist has the ability to recognize incipient deformities.

There is another reason why prophylactic orthodontics should be practiced. It is one practical method of extending orthodontic service. That extension of this service is immediately and urgently necessary is apparent from only superficial study of the reports on the incidence of malocclusion among the school age groups of our population. Conservative estimates place 25 per cent of school children in a class requiring *active* orthodontic treatment.[1] *Active* orthodontic treatment is understood to mean that type of treatment requiring the administration of major biomechanical procedures such as the qualified specialist alone is capable of applying.

The 1940 census showed 33,000,000 individuals in this country, 14 years of age or less. Of this number, 10,500,000 are of elementary school age, i.e., between 6 and 14 years. Computed on the conservative basis that 25 per cent of school age children need active treatment, there are today 2,625,000 children in the United States needing orthodontic services. With the latest (1948) edition of the *Orthodontic Directory of the World,* listing less than 1,500 orthodontists in this country, it is apparent that even if the financial barriers to the extension of orthodontic treatment were removed through government subsidy, the number of operators available to treat this group would be inadequate. To supply active orthodontic treatment on a nationwide basis would require that each orthodontist treat more than 1,750 patients annually. This is an obvious impossibility. Moreover, it is not likely that the dental man power could ever be brought up to the numerical strength required to furnish *active* orthodontic treatment to so large a population group.

The solution of the problem then, if there is one, lies in preventing the potential or developing dentofacial anomaly from reaching the stage where active treatment is necessary. In a word, we must extend our preventive or prophylactic practice of orthodontics. It is within the realm of possibility, even with the present shortage of dentists, to make preventive orthodontic service available to every child of this country. If and when this is done, we will have reached a point where the seemingly insurmountable task of providing adequate orthodontic service for all children of our land is a near reality.

The general practitioner of dentistry is the key figure in the solution of this problem. The members of this group can intercept or prevent a sizable

percentage of dentofacial anomalies. Some observers have stated that more than 80 per cent of malocclusion is controllable.[2]

It is likely that such estimates are high, but we do believe that there are enough indications to practice prophylactic orthodontics to make a consideration of methods and techniques a practical one.

There are significant numbers of oral and dentofacial anomalies that can be wholly prevented or the factors which cause them rendered so impotent as to obstruct the development of severe malocclusions.

The prophylactic methods and techniques to be used in the practice of preventive orthodontics should be well known to every orthodontist, pedodontist, and general practitioner of dentistry. Of this group, the latter two will have more opportunities to apply prophylactic measures than will the former. This is so because the general practitioner and the pedodontist see the child patient earlier and more often than does the orthodontist. Furthermore, the child patient who comes to the orthodontist is one who is usually referred to him because malocclusion has already developed. Corrective rather than preventive service is sought by most of the patients who come to an orthodontist's office. However, this does not obviate the orthodontist's being well informed about this subject.

While the consideration of prophylactic methods and techniques that is to follow emphasizes procedures that are effective in preventing local factors from causing malocclusion, we do not wish to infer that anomalies of developmental origin are not amenable to preventive measures. Some are and we shall name them.

We are not so naïve as to suggest that the list of prophylactic procedures to be given is a complete or even comprehensive cataloguing of techniques. It is our sincere belief, however, that all are useful and practical routines. Because these techniques can have everyday application in the general practice of dentistry, we make no apology for the repetition of some that may already be well known to the reader.

The first step in the practice of prophylactic orthodontics is a careful examination of the patient. The following examination routines are suggested:

I. EXAMINATION

1. *Examine the occlusion.* Develop the habit of beginning or concluding oral examinations by having patients close their teeth in centric occlusal relation. Examine the relationship of opposing maxillary and mandibular teeth with the mandible in centric and eccentric positions. It is surprising to learn how many so-called oral examinations, while carefully made for the exploration of dental caries and pathology of the soft tissues of the mouth, completely overlook the state of the occlusion. This is truly a case of seeing the trees and overlooking the forest!

2. *Count the teeth present in the maxillary and mandibular dental arches.* It will be a revelation to any operator who does not routinely try to account for each tooth, to learn how many times teeth are found missing, a condition that might otherwise go unrecognized when teeth are not counted. Missing teeth are never overlooked when the practice of counting teeth is adopted. When a tooth is absent, questions directed to the patient, followed by roentgenograms of the

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The first step in the practice of prophylactic orthodontics is a careful examination of the patient. The following examination routines are suggested:

I. EXAMINATION

1. *Examine the occlusion.* Develop the habit of beginning or concluding oral examinations by having patients close their teeth in centric occlusal relation. Examine the relationship of opposing maxillary and mandibular teeth with the mandible in centric and eccentric positions. It is surprising to learn how many so-called oral examinations, while carefully made for the exploration of dental caries and pathology of the soft tissues of the mouth, completely overlook the state of the occlusion. This is truly a case of seeing the trees and overlooking the forest!

2. *Count the teeth present in the maxillary and mandibular dental arches.* It will be a revelation to any operator who does not routinely try to account for each tooth, to learn how many times teeth are found missing, a condition that might otherwise go unrecognized when teeth are not counted. Missing teeth are never overlooked when the practice of counting teeth is adopted. When a tooth is absent, questions directed to the patient, followed by roentgenograms of the

areas under question, will aid in classifying the missing tooth as being unerupted, impacted, extracted, or congenitally absent.

3. *Take at least five Bitewing films of every child patient.* Three anterior and two posterior views taken with films designed for the Bitewing technique will not only record all interproximal caries and reveal the progress of resorption of the roots of the primary teeth, but also will show the crowns of most developing permanent teeth if present. Whenever apical pathology is suspected or information is needed about areas not included in the Bitewing film range, supplement the roentgenograms taken with regular periapical films.

4. *Learn to appreciate the fact that certain natural adjustments take place in the positions and relations that some teeth assume at the time of their eruption, compared to the positions and relations in which they are eventually established.* If judgment is passed on some teeth without regard for the transitory nature of their locations, it may erroneously relegate them to the class of malposed or malocluding teeth. Subsequent observation will reveal that many such teeth assume their proper positions in the dental arches.

Examples of the typical developmental stages through which most normal dentures pass before a satisfactory mature occlusion is evolved are these:

a. *At the ages of 6 to 7 years the opposing first permanent molars quite frequently erupt with an end-to-end or cusp-to-cusp relation instead of the cusp groove occlusal relation that is found after the primary molars are exfoliated.* Normally the distal surfaces of the maxillary and mandibular second primary molars lie in nearly the same anteroposterior plane when the teeth are closed in centric occlusal relation. Since the anteroposterior relations the first permanent molars assume at the time of their eruption are largely dependent upon the positions of the primary molars they contact, it follows that the mesial surfaces of these permanent teeth will lie in a common anteroposterior plane, and their cusp-to-cusp occlusion, previously mentioned, is thus established. This occlusal relation is normally altered at the time the primary molars are replaced by premolars. Since the mandibular first permanent molar has room to shift more anteriorly than the maxillary first permanent molar, and does so, the eventual positions of these teeth are such that the mesiobuccal cusp of the maxillary first molar occludes in the buccal groove of the mandibular first molar.

b. *From the time of their eruption up to the age of 9 years the mandibular permanent incisors are usually crowded.* First the central incisors and later the lateral incisors often erupt in positions that are lingual to the line of occlusion. Minor irregularities in the relations of these teeth should not be considered as evidence of malocclusion until after the eruption of the permanent canines. To do so overlooks the fact that the intracanine width of the mandibular arch is not maximal until after the age of 10 years, and that with the width dimension increasing, more space is made available to the crowded incisors. Given the required space, the crowded incisors will often correct their positions assisted by the molding action of the muscles of the tongue and the lips.

c. *At the age of 7 to 8 years space between the maxillary permanent central incisors is not unusual or abnormal.* Such a diastema may close or persist with the eruption of the permanent lateral incisors. There is no cause for concern about this space until it is evident that the wedging action of the erupting maxillary permanent canines will be insufficient to close the diastema. Since the canines erupt at the age of 12 years, it is difficult, except in extreme cases, to make a certain

diagnosis of persistent diastema much before the patient reaches that age, and, therefore, treatment prior to eruption of the canines is frequently an irrational and unnecessary procedure.

The maxillary frenum labium is often unjustly blamed for spaced central incisors. As Dewel[4] has pointed out, there are other factors to consider such as "tongue pressure, lip habits, closed bite, and peg-shaped or absent lateral incisors" because they may "also cause separation of anterior teeth."

d. *Between the ages of 9 and 11 years axial perversions of maxillary lateral incisors are often observed.*

The experience of every dentist who works for children will include more than one case that exemplifies another normal developmental denture change that frequently occurs in the maxillary incisor area. These cases will present a history of the permanent maxillary incisors having erupted in good axial relations. At the age of 9 or 10 years the well-positioned lateral incisors became slightly rotated and the axial relation of these teeth was definitely affected. If roentgenograms were made at this time, showing the relationship of the crowns of the unerupted maxillary canines and the roots of the displaced lateral incisors, their findings would help to explain this condition. Pressure from the crowns of the unerupted canines against the distal aspects of roots of the lateral incisors accounts for the changes in the positions of the lateral incisors previously described. As the canines, with their eruptive movement, travel toward the incisal plane, the crowns of these teeth subsequently reach a point where they no longer contact the roots of the lateral incisors. When this stage of development is reached, the displaced lateral incisors usually begin to make adjustments in their relations which eventually bring them back to ideal positions. The denture of the patient thus passes through what Broadbent calls the "ugly duckling" stage.

e. *Deep (not excessive) vertical overbites may improve up to the age of 20 years.* The depth of the vertical overbite is subject to constant change from the time the primary incisors begin to erupt at the age of 6 to 8 months, up to the age of 20 years. At the age of 2 to 3 years, the vertical overbite in the primary dentition is deep in comparison to that which is found at the age of 5 years. At this age the overbite may be slight or even absent because of the increasing vertical height of the ramus which pushes the mandible downward and forward away from the cranium. This fact, along with attritior of the anterior teeth, frequently places the primary maxillary and mandibular incisor teeth in a near end-to-end relation. With the eruption of the permanent incisors, the vertical overbite once more becomes deep. Its depth gradually lessens as the primary molars are exfoliated and the succedaneous teeth erupt. The depth of the overbite will normally continue to diminish until the age of 18 to 20 years. It is at this age that the hyaline cartilage in the condyle of the mandible is finally and completely replaced by bone. When this change is consummated, vertical growth of the jaws is completed.

In reviewing the preceding five topics one fact clearly emerges. Occlusion is not a static, but a dynamic phenomenon. Its development is inextricably associated with growth of the jaws, face, and cranium. Just as these structures are in a constant state of flux during the early years of an individual's life, so too are the teeth changing in their relations to these parts and to each other.

In recognition of this, Hellman[5] stated, "Diagnosis of occlusion really becomes diagnosis in development."

5. *Take impressions and make casts of the teeth whenever there is question of the manner in which occlusion is developing.* Carefully written case histories augmented by dental casts and roentgenograms of the patient provide the operator with material that makes diagnosis a rational rather than an empirical procedure.

A study of these progress records made at six-month intervals will enable the operator to predict the trends and probable future growth tendencies of the case in question. Many cases are not so much problems of determining the present status of development of the dentofacial complex as of predicting the ultimate outcome of the development. By a process of careful observation that includes taking the case history, making dental casts and roentgenograms, the operator acquires factual information about the patient which enables him to advise anxious parents intelligently about the dentofacial development of their children. Those dental practitioners whose advice is based upon this observational method need never fear that their counsel lacks sound professional value. They cannot be grouped with that class of dentists who adopt the lazy man's dodge of telling all parents who inquire about the relations of their children's teeth and their possible need of orthodontic assistance that they should "just wait a while longer; nature will take care of everything." Some patients who have been advised to wait, when the folly of waiting should have been apparent to the conscientious and well-informed observer, become the complicated treatment cases that finally find their way to the specialist too late for him to render a maximum satisfactory service.

Following the use of a careful examination routine, the second step in the practice of prophylactic orthodontics is the application of certain treatment procedures. A useful list follows.

II. TREATMENT

1. *Exercise great care in restoring the occlusal and proximal aspects of the primary and permanent teeth.* Proximal restorations in the primary molars and permanent teeth should be so inserted that the replacements accurately duplicate the original size and contour of the teeth. Contact areas are sometimes left unrestored, especially in the primary dentition. This favors an unnatural or premature anterior shifting of posterior teeth which may become a factor in establishing abnormal occlusal relationships between the opposing maxillary and mandibular teeth. If good cuspal interlocking develops, these malrelations of opposing teeth may be perpetuated in spite of any amount of normal growth and development of the denture and its associated structures. This exemplifies the action of a local factor, the improperly contoured restoration, in the causation of malocclusion. The operator who exercises proper care in repairing proximal carious areas is preventing the development of this type of malocclusion and practicing prophylactic orthodontics along with good operative dentistry.

Incorrectly carved occlusal restorations, producing an anomalous topographic anatomy, may also become a cause of malocclusion in a manner similar to that in which improper proximal restorations do. The altered occlusal form may allow or favor abnormal shifting of teeth and the development of malocclusion.

Overfilling the proximal aspects of primary teeth may be as damaging to normal occlusion as failing to restore contact (Figs. 1 and 2).

2. *Extract primary teeth at the correct time, being certain that a succedaneous tooth is present before removing the primary tooth.* A well-recognized cause of malocclusion is the too long retention of primary teeth. It is obvious that

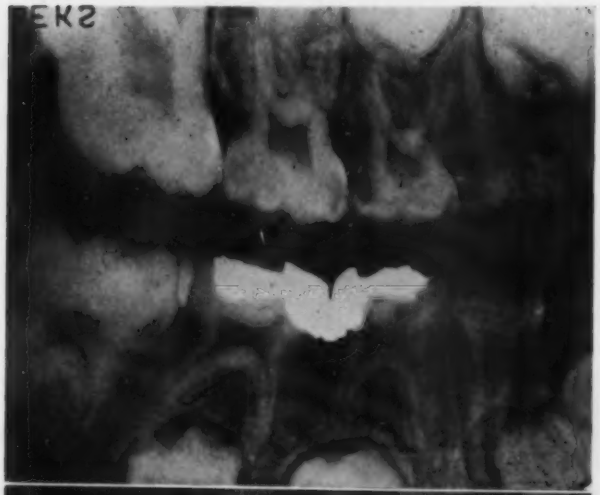


Fig. 1.

Fig. 2.

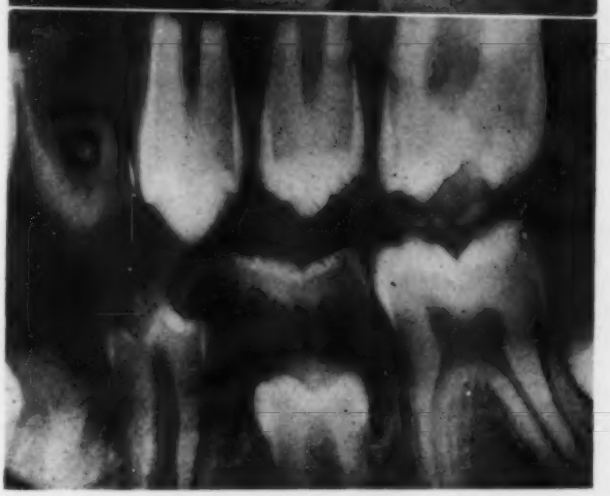


Fig. 3.

Fig. 1.—Overfilling the mandibular first and second deciduous molars is aggravating the tendency of the opposing first permanent molars to assume a Class II relationship.

Fig. 2.—The cervical overhang on the restoration in the mandibular second deciduous molar may subsequently interfere with the eruption and the correct positioning of the mandibular first premolar.

Fig. 3.—Failure of one root to resorb may be the cause of too long retention of primary molars. If these teeth are not exfoliated at the proper time they must be extracted.

timely extraction of these teeth is one method of practicing prophylactic orthodontics. To determine the appropriate time to extract primary teeth, consider the following:

a. *Chronological age of the patient.* The average age at which permanent teeth erupt is well known. Normally, the primary teeth should be exfoliated just a few days or a few weeks before the eruption of the succeeding permanent teeth. The difficulty connected with the use of the chronology of the dentition is that it represents *average* ages at which the various teeth erupt. It is dangerous to apply *averages* to the *individual.*

b. *Clinical findings.* Observe the teeth that are present (erupted) in the other three comparable quadrants of the dentition, to know if the tooth in question is being retained too long. For example, when there is uncertainty whether a primary molar is being overretained, it can be dispelled if the clinical examination reveals that in the other three comparable quadrants the primary molars are exfoliated and the succedaneous teeth are erupted.

c. *Roentgenographic findings.* If the roentgenograms reveal that the calcification of the roots of the delayed unerupted permanent tooth has progressed as far as halfway to completion, the overlying primary tooth should be extracted to give the permanent tooth an opportunity to erupt. Or if the roentgenograms show that resorption of the roots of the primary teeth is complete on one aspect of a root or one root of a multirooted tooth, the ectopic relation of the succedaneous tooth should be recognized and the primary tooth extracted (Fig. 3). The detection of such conditions that are promptly corrected by timely extraction of the primary teeth is an effective method of practicing prophylactic orthodontics.

Roentgenograms are indispensable in making a diagnosis in most of these cases, because even though the chronological age of the patient and the clinical findings may suggest that the primary tooth is being overretained, there always are the questions of the presence or absence of the succeeding permanent tooth, the amount of root resorption of the primary tooth, and the degree of calcification of the succedaneous tooth to be answered.

3. *Trim the primary molars when necessary.* There are indications for reducing the mesiodistal width of primary molars by slicing or trimming. This is an operation that can be effective in preventing malocclusion in selected cases, if done at the proper time.

a. *Inlay the primary molar when its permanent successor is missing.* Slicing the proximal aspects of these primary molars for preparation of an M-O-D type restoration allows the operator to change the topographic anatomy and mesiodistal width of the primary tooth. Both changes are necessary if normal occlusion is to be evolved in this type of case. The occlusal anatomy must be altered to suit the occlusion of the primary tooth to the opposing permanent teeth. The mesiodistal width of the primary tooth must be reduced to premolar size to give the permanent molars a chance to shift into proper occlusal interrelationships.

b. *Trim second primary molars when a developing Class II or Class III relationship of the teeth seems avoidable by so doing or when impaction of a first premolar can thus be prevented.* There are occasions when the occlusal relationship that develops between erupting first permanent molars is such as to favor the subsequent establishment

of Class II or Class III malocclusions. The alert observer will recognize opportunities to prevent these eventualities from coming to pass. By trimming the distal surfaces of the appropriate second primary molars (the maxillary to intercept developing Class III cases, the mandibular in Class II cases), a desirable change in the position of the maxillary or mandibular first permanent molars can be effected. The maxillary or mandibular first molars are allowed to shift. This molar positional change favorably affects the cuspal interdigitation of the opposing first permanent molars. It prevents them from becoming established in definite Class II or Class III relationships, and encourages the development of a Class I molar occlusion (Figs. 4 and 5).

Fig. 4.

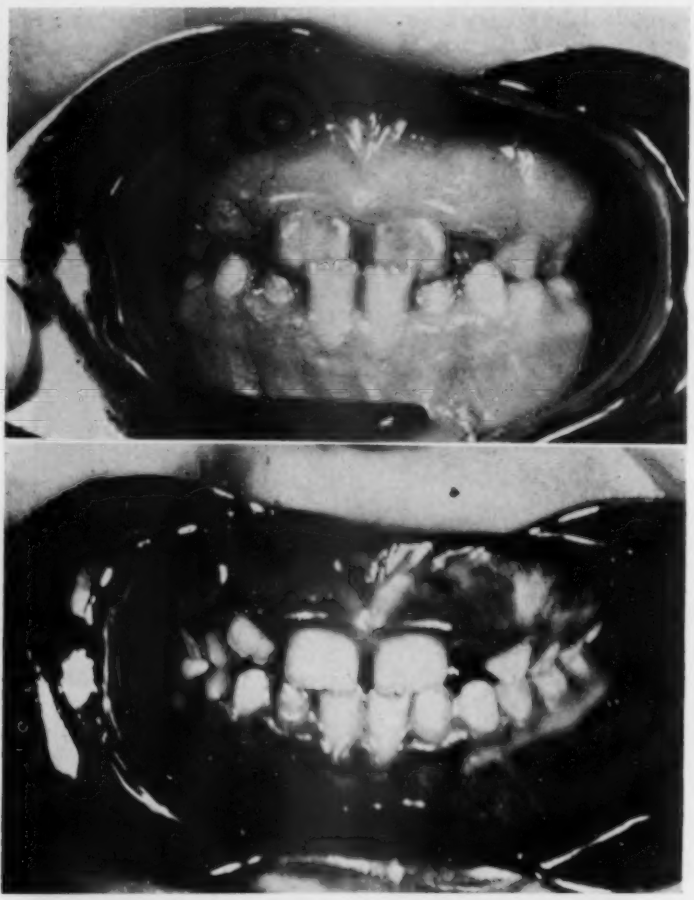
Fig. 5.

Fig. 4.—The premature loss of the maxillary primary molars and the consequent early anterior shift of the maxillary first permanent molar are favoring the establishment of an abnormal occlusal relationship between the opposing first molars. The distal surface of the mandibular second primary molar should be trimmed.

Fig. 5.—The distal surface of the mandibular second primary molar should be trimmed in an effort to avoid the locking of the distobuccal cusp of the maxillary first permanent molar in the buccal groove of the mandibular first permanent molar.

A distinction must be made between the types of cases considered here and the normal. It is to be recalled that the cuspal relationship of opposing first permanent molars appears Class II in type until the primary molars are exfoliated and the "molar shift" occurs. There is, of course, no indication for trimming primary molars in these cases.

A.



B.

Fig. 6.—*A*, Ideal indication for the use of tongue depressor blade technique to correct an incisor cross-bite.

B, Correction effected second day after using tongue blades.

Another instance in which trimming the second primary molar may be a means of preventing malocclusion is to be found in those cases with an insufficient amount of space for the eruption of the first premolar. This is exemplified more frequently in the mandibular than in the maxillary arch. The typical situation is this: the mandibular canine uses some of the space created by the exfoliation of the first primary molar. The mandibular premolar has a mesiodistal crown width in excess of the space available between the distal surface of the permanent canine and the mesial surface of the second primary molar. Because of this the premolar will be impacted or forced to erupt in buccal or linguoversion. In such cases it is safe and advisable to relieve

the impacted position of the premolar or prevent its buccal or lingual deflection by immediately creating more room in this area of the arch. This is done by slicing the mesial aspect of the second primary molar.

4. *Use tongue depressor blades for the correction of incisor cross-bites when the overbite (horizontal and vertical) is not extreme and there is room to move the incisors labiolingually.* With cooperative patients, it is possible to prescribe a home treatment routine that will eliminate anterior cross-bites in several days.

Fig. 7.

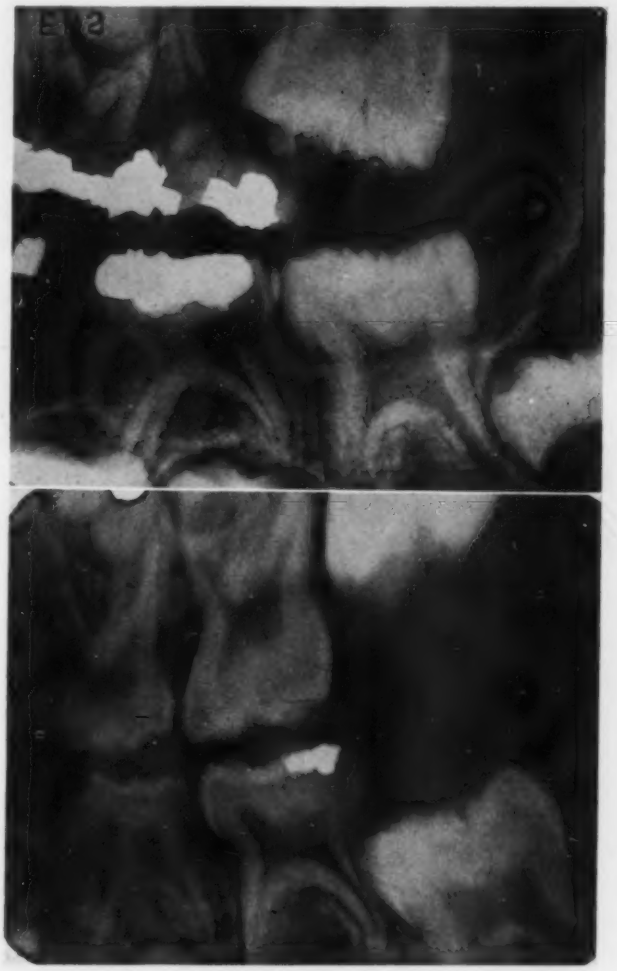


Fig. 8.

Fig. 7.—Ectopic eruption of the maxillary first permanent molar has resorbed completely the distobuccal root of the maxillary second primary molar. Extraction of the primary molar is an immediate necessity.

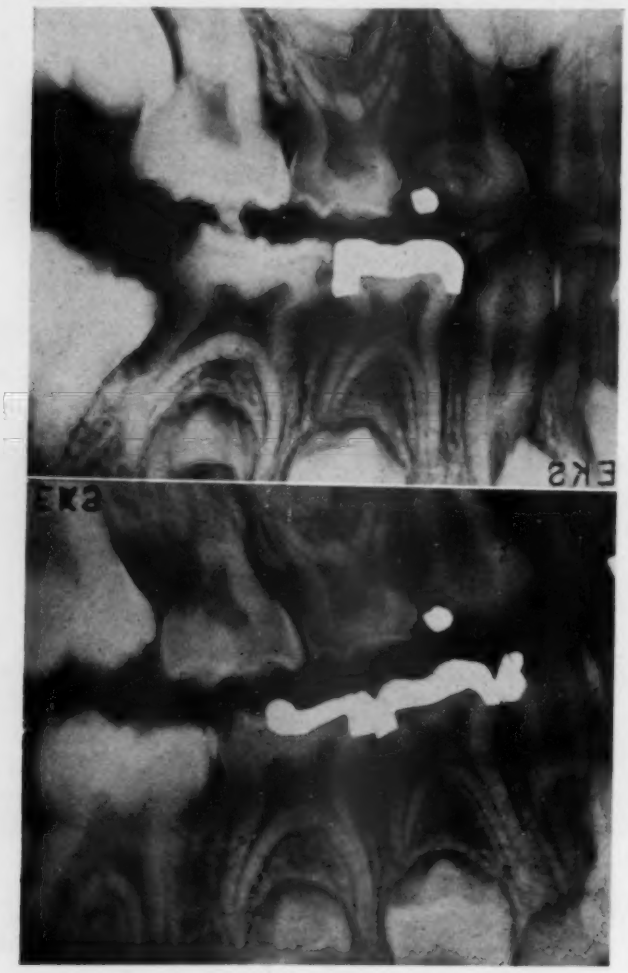
Fig. 8.—Ectopically erupting mandibular first permanent molar impacted on the second primary molar.

The patients are given the following instructions: place a tongue depressor blade on the lingual aspect of the maxillary incisor tooth or teeth that are locked posterior to the mandibular incisors. Close the teeth in centric, bringing a maximum amount of force to bear on the intervening wooden tongue blade. With this force being maintained on the tongue blade, pull the blade backward as far as possible. Hold the tongue blade and the teeth in this relation while slowly counting to twenty-five. Release the pressure and then repeat the exercise. The exercise should be performed thus five times at one sitting. There

should be a minimum of six sittings per day. This technique can be used effectively where the overbite is not deep, and the teeth to be moved across the occlusion are free to be tipped labiolingually (Fig. 6, *A* and *B*).

The prophylactic or preventive aspects of this treatment method may not be immediately apparent. However, many orthodontists believe that by correcting incisor cross-bites at an early age the development of potential Class III dentofacial abnormalities is prevented.

A.



B.

Fig. 9.—*A*, Ectopically erupting maxillary first permanent molar that may be assisted by the use of brass ligature wire technique.

***B*, Result obtained from the use of brass wire on case shown in *A*.**

5. *Use brass ligature (23-gauge) separating wire to release first permanent molars from impacted positions on the distal surfaces of the crowns of the second primary molars.* Ectopic eruption of the first permanent molars may cause early loss of the second primary molar (Fig. 7). More frequently it delays the eruption of the permanent tooth when it (the first permanent molar) becomes impacted on the distal bulge of the crown of the second primary molar (Fig. 8).

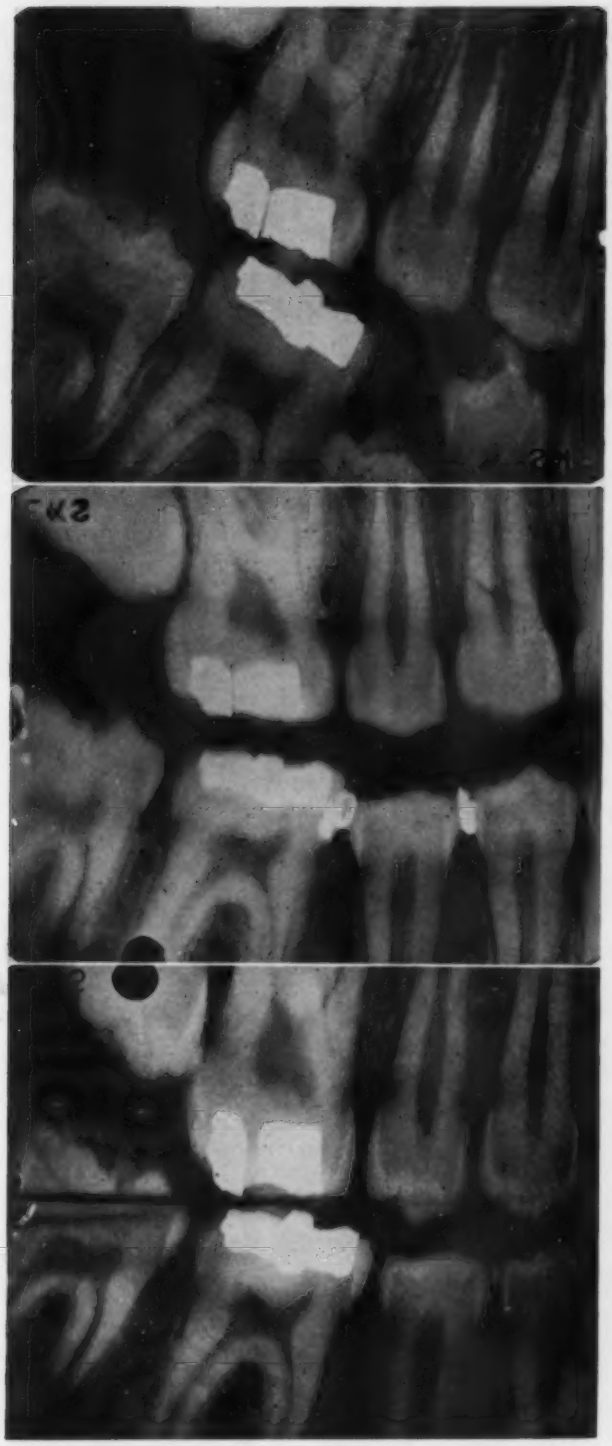


Fig. 10.—*A*, Insufficient space for the normal eruption of the mandibular second premolar. *B*, Additional space being acquired for the erupting mandibular second premolar through the use of brass ligature separating wires.
C, Mandibular second premolar erupted to normal occlusal plane. Outcome of the case shown in *A* and *B*.

Neither condition will favor the development of normal occlusion. A simple and effective method of relieving impacted first molars is to thread a brass ligature wire between the primary and permanent molar. The free ends of the wire are twisted together until a wedge force is directed against the teeth. The action of this separator will drive the ectopically erupting first permanent molar posteriorly enough to relieve its impaction on the primary molar and favor normal eruption of the permanent molar (Fig. 9, *A* and *B*).

The same mechanotherapy has a less common application in assisting the eruption of mandibular second premolars when there is not quite sufficient space for their correct eruption (Fig. 10, *A*, *B*, and *C*).

6. *Carefully consider the probable results of extracting primary or permanent teeth before recommending their removal.* The operator should try to foresee the effects of extractions. There is a great deal written and said about extraction of teeth in orthodontic therapy. In selected cases, there are benefits to be derived from removing primary and permanent teeth. Extracting permanent teeth for preventive or corrective purposes may be attended by complications, especially when orthodontic mechanotherapy does not follow.

a. *Extraction of a mandibular permanent incisor in order to make room for a more satisfactory alignment of anterior teeth is seldom indicated.* In these cases the vertical overbite invariably becomes deeper following the extraction and subsequent rearrangement of anterior teeth. If the overbite is of average or more than average depth, the operator would do well to consider the possibility that in securing a more favorable positioning of incisors by extracting one, an even less desirable condition may be created. The ensuing deep bite and locked occlusion are factors which predispose the individual to periodontal disease. If the overbite is very shallow or if an anterior open-bite is present, this word of caution does not apply.

b. *Extraction of a primary canine to relieve crowding in the permanent incisor region is rarely indicated.* The complication that arises out of this procedure is one born of the shortsighted policy of extracting two teeth to make room for the eruption of one. If the primary lateral and canine are extracted to make room for the erupting permanent lateral incisor, a future complication must be faced when the permanent canine begins to erupt. There will be insufficient space for the canine because of the distally drifted lateral incisor. Hatfield has aptly referred to this practice as "robbing Peter to pay Paul."

The only exception to the preceding statements is to be found in those cases in which careful measurements reveal that the combined mesiodistal widths of the crowns of the primary canines and first and second molars is in excess of the widths of their permanent successors by at least 1.7 mm. on each side. As Nance[6] has shown, if the difference or "leeway" in measurements is this great or greater, a preventive lingual arch may be placed when the roots of the mandibular second primary molars are nearly resorbed, or when the erupting permanent canines and first premolars need space. Cases falling in the category of those with adequate "leeway" may be helped by extracting mandibular canines and primary molars before the time of their normal exfoliation, if the preventive lingual arch is used, and provided the occlusal relationship of the first permanent molars is correct.

c. *Extraction of the primary tooth is an immediate indication when its succedaneous tooth is erupting.* "*Rule:* It is not good practice to permit a primary tooth and its permanent successor to be in evidence in the mouth at the same time (Fig. 11). *Exception:* When

Fig. 11.

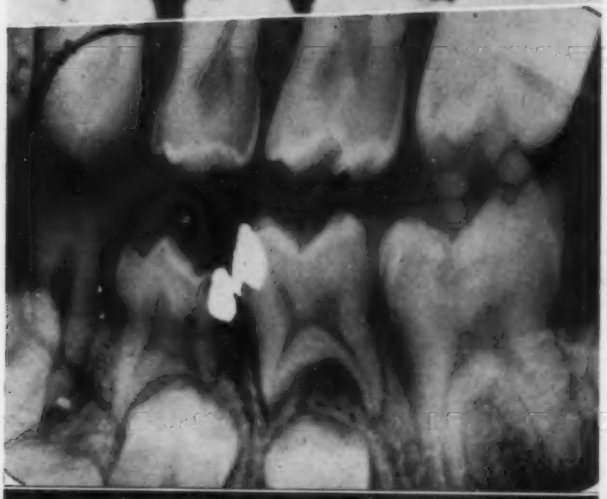


Fig. 12.

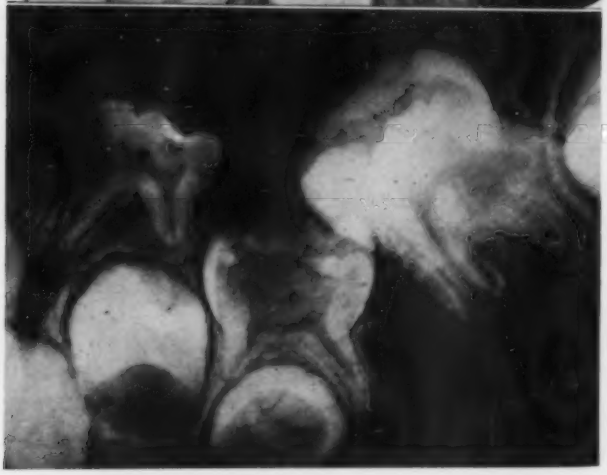


Fig. 13.

Fig. 11.—Indication for the immediate extraction of the retained mandibular primary lateral incisors.

Fig. 12.—Ankylosis of the mandibular first primary molar. At this stage intervention is unnecessary; observation is necessary.

Fig. 13.—Ankylosis of the mandibular second primary molar. Immediate extraction of the "submerged" primary molar is necessary.

congenital absence of one permanent allows a primary tooth and its own permanent successor to erupt adjacently."[1] There is no evidence to support the belief that there is some advantage to be gained by leaving primary teeth in the arch beyond the time that their permanent successors have erupted. On the contrary, all orthodontists have observed cases of malocclusion that had their origin in the too long retention of primary teeth. In view of this fact, it is difficult to find justification for the policy of leaving mandibular primary incisors in situ when their permanent successors are erupting lingually. The advocates of this practice mistakenly expect the retained tooth magically to stimulate mandibular growth in the incisor region.

d. *Timely extraction of "submerged" primary teeth is always indicated.* These so-called submerged teeth are ankylosed. The ankylosis between the root of the primary tooth and the alveolar process will often prevent normal exfoliation or, at best, delay it. The only reason for maintaining these teeth is a negative one because, generally speaking, no problem of space maintenance has to be faced while the ankylosed primary tooth is present.

These teeth are worth little more than space maintainers, however, because they are always short of the normal occlusal plane and, since they are out of occlusion, are of negligible functional value. The practice of increasing the length of their clinical crowns with cast overlays is usually dissatisfying because the continuing eruption of the adjacent teeth soon leaves the ankylosed tooth again short of the occlusal plane.

The most prudent management of these teeth lies with careful observation of the case. If the teeth do not become too extremely submerged, they may be kept until clinical and roentgenographic evidence indicates that their removal will be followed by prompt eruption of their succedaneous teeth (Fig. 12). If observation shows the ankylosed teeth are being engulfed by the continuing vertical growth of the adjacent teeth and their processes, extraction is immediately indicated (Fig. 13). Whether a space maintainer will or will not be needed following the extraction depends upon the area involved, the proximity of the permanent successor to eruption, and the tendency of the space to open, remain the same, or close.

7. *Extract supernumerary teeth whenever and wherever found.* The case is rare indeed where sufficient room is present for an extra tooth without seriously interfering with the development of normal occlusion. Supernumerary teeth are easily detected when present and erupted. Their existence should always be suspicioned in those cases in which primary central incisors are retained too long or where permanent maxillary incisors are late erupting (Fig. 14). Roentgenograms are essential in making a diagnosis (Fig. 15, *A* and *B*).

There are two ways in which supernumerary teeth may cause malocclusion: first, by eruption, their presence in the dental arch crowds adjacent teeth out of their normal positions (Fig. 16); second, by noneruption, they cause the impaction of permanent teeth (particularly maxillary central incisors) (Fig. 17, *A* and *B*) or deflect permanent teeth by exerting pressure against them during the time they are erupting or after they have erupted.

The consistency with which these teeth cause trouble should make it evident that the operator who finds them early and extracts them promptly is rendering a genuine prophylactic service.

8. *Surgically expose the crowns of those permanent teeth that are retarded in their eruption.* Teeth that fail to erupt can be stimulated to do so by removing the hard and soft tissue overlying their crowns. Following the operation

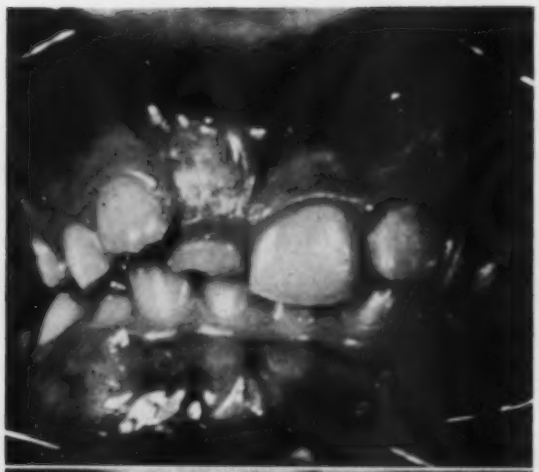


Fig. 14.

Fig. 15, *A*.

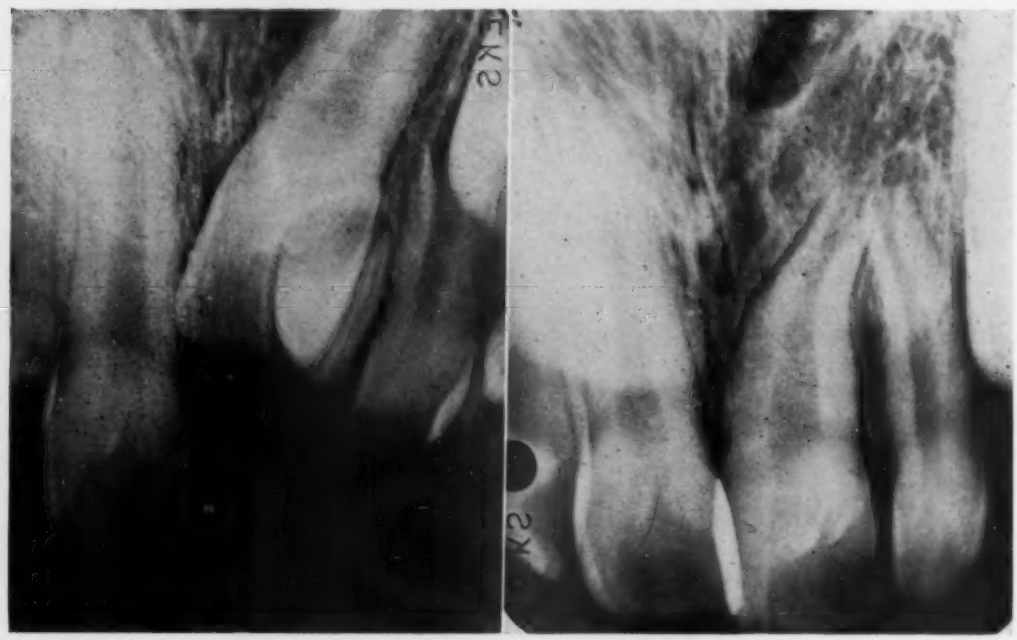
Fig. 15, *B*.

Fig. 14.—Retention of a maxillary primary central incisor. Presence of a supernumerary tooth, preventing the eruption of the permanent central incisor, should be looked for.

Fig. 15.—*A*, Supernumerary tooth in the primary maxillary incisor area.

B, Roentgenogram of maxillary incisor area shown in *A* reveals presence of another supernumerary tooth. This one is unerupted.

Fig. 16.—Supernumerary tooth in the maxillary median line is the cause of a large diastema between the permanent central incisors.



A. *B.*

Fig. 17.—*A*, A supernumerary tooth preventing the eruption of the maxillary central incisor.

B, Following the removal of the supernumerary tooth shown in *A*, the maxillary central incisor erupted uneventfully.

a surgical cement or iodoform gauze dressing should be placed in the wound to encourage peripheral healing and prevent the too rapid formation of granulation tissue over the exposed area which would cover the tooth crown and defeat the purpose of the surgery.

The indication for this procedure is to be found in those cases where a permanent tooth, without apparent reason, fails to erupt. In instances in which there is no mechanical hindrance, no impaction to account for the noneruption of a tooth that should have erupted earlier, exposing the crown of the tooth will usually initiate the eruptive process. This method of stimulating retarded teeth to erupt is so effective that in recent years we have found it unnecessary to use an orthodontic appliance to exert force upon those teeth. They will erupt without such mechanical assistance, if their axial positions are not perverted extremely.

The teeth that are most frequently retarded and need assistance of this kind are the maxillary canines, the mandibular and maxillary second premolars.

Causing the eruption of these retarded teeth before the adjacent permanent teeth shift into their space and either impact them or force them to erupt in malpositions is a valuable type of preventive orthodontics.

9. *Break oral habits at the earliest possible time.* The therapy of habit eradication is most effective when applied at an early stage. There are many different kinds of oral habits which are potentially destructive to the development of a normal dentofacial complex. Among the more common ones are:

1. *Sucking habits:*
   a. Thumb- and finger-sucking.
   b. Lip- and cheek-sucking.
2. *Biting habits:*
   a. Lip-biting.
   b. Nail-biting.
3. *Swallowing habits:*
   a. Tongue-thrusting.

Thumb and finger habits are the most common of all oral habits. Most infants suck their thumbs or fingers. In some, the sucking act is practiced to excess and is not discontinued, as is usually the case, by the age of two years. The persistence of the habit beyond the time of eruption of the permanent central incisors is often attended by malocclusion. Rather than take a chance on self-correction, even though the odds are in favor of it, we believe that early interception and eradication of sucking habits are the safest and wisest policies. In their incipiency, these, as all other habits, are easy to break. Simple corrective measures are effective in the early stages; radical methods must be employed later.

There are three general types of therapy that may be employed to cause discontinuance of perverted sucking habits, viz., chemical, mechanical, and psychological.

The chemical therapy uses distasteful agents, hot-tasting or bitter-flavored preparations that are applied to the fingers or thumb. These drugs (cayenne pepper, quinine, asafetida, etc.) are supposed to be so unpleasant to the taste that the child will keep the thumb and fingers that are treated with them out of his mouth. In our experience, drugs have been ineffective corrective agents except in a few cases in which the sucking habits were not too firmly established.

The mechanical therapy uses a variety of appliances that, in one manner or another, make the sucking act difficult or impossible to practice. In this type is to be found such simple devices as fingerstalls, adhesive plaster on the fingers, and mittens sewed into the cuffs of sleeping garments at points where flexion of the arm would be inhibited.

There are many patented devices for breaking sucking habits. Appliances are in use that fit over the elbow to limit flexion of the arm, or aluminum spheres that enclose the whole hand, or a metal framework that encases a single digit.

One of the most effective mechanical appliances for stopping thumb-sucking is an intraoral device that is specially fabricated for the individual case. The base of the appliance is a lingual arch wire with auxiliary wires soldered thereon, forming a latticework that covers the anterior portion of the hard palate. The appliance is so designed as to make it impossible for the thumb-sucker to place the palmar surface of the thumb in contact with the palatal gingiva (Fig. 18). This prohibition makes practice of the act less satisfying and is generally successful in breaking even the most stubborn thumb-sucking habits.

Fig. 18.—An intraoral appliance designed to break a thumb-sucking habit.

A psychological therapy for habit breaking was suggested by Dunlap.[7] He named it the Beta hypothesis. In its application, the habit to be corrected is intentionally practiced so that the individual may thereby learn how to stop performing the act. The child is made to realize that this purposeful repetition of the habit is intended to help him break his habit. He is forced to concentrate on the performance of the act all the time he is practicing it. The effect of this program is to take the satisfaction and pleasure out of the habit and eventually associate the practice of it with painful or unpleasant reactions. When this state of mind is reached the habit will be abandoned. Obviously this is a therapy which can only be applied to older children where cooperation can be obtained.

There are other means of causing the discontinuance of perverted sucking habits. Many times when a therapy fails to produce the desired result of breaking the habit, it is the fault of those applying the treatment rather than the therapy itself. Parents are not consistent in the routine that must be followed to cause discontinuance of the habit. They may begin and be constant enough at the outset, but later, out of deference to the child's feelings or because they (the parents) lack tenacity of purpose, they become careless and inconstant. This dooms all efforts to failure.

Some workers in the field of mental hygiene have criticized orthodontists for their efforts to break thumb-sucking habits. They speak of the "psychologic trauma" inflicted by habit correction. In those cases where habits are not naturally abandoned and must be broken, it is likely that the physiologic and psychologic trauma that must be imposed later to cause discontinuance of the act is considerable. The psychologic trauma is minimal if habit therapy is applied early.

Lip- and cheek-sucking habits are much less common than thumb-sucking, but, if vigorously practiced over a sufficiently long period, may be a cause of malocclusion.

Intraoral appliances, specially designed to prick the lips or cheeks whenever they are sucked, are the most effective means of breaking these undesirable oral habits.

Lip-biting habits may be destructive to normal occlusion. The lower lip is bitten more often than the upper lip. Protraction of the maxillary incisors can be caused by habitually drawing the vermilion border of the lower lip across the incisal thirds of the lingual surfaces of these incisor teeth. Sometimes lip-biting and lip-sucking habits are developed after and because of the protraction of maxillary incisors. In these cases the normal resting position of the lower lip is lingual to the maxillary incisors instead of labial to it. With such a relation, lip-biting or sucking habits are easily developed. Under these circumstances, the oral habit is a secondary rather than a primary etiological factor. All such oral habits must be detected and corrected if dentofacial abnormalities that are produced by them are to be prevented.

A common method of breaking lip-biting and sucking habits is by the application of a band with a sharp lingual spur to a maxillary incisor tooth. This device will prick the lip every time the child begins to bite or suck it. An appliance of this type is easily made and usually effective.

Perverted swallowing habits are often manifested as tongue-thrusting. Tongue-thrusting is often observed in an anterior open-bite type of malocclusion. Neither the tongue-thrusting habit nor the anterior open-bite which it produces is observed until after the damage of the perverted swallowing has been wrought. At this stage, corrective rather than preventive or prophylactic measures are needed. However, treatment of the open-bite malocclusion, no matter how well done, will not be a lasting success if the tongue-thrusting habit is unbroken.

Exercises that teach "passive swallowing" are of assistance in these cases. But since the swallowing act is performed many times during the day and night, there will be some times when the act is subconsciously done. On these occasions the individual will practice, unless prohibited from doing so, the perverted swallowing.

Again, mechanical appliances are useful to break the habit. In these cases a wire barrier that is part of a maxillary lingual appliance is placed in front of the tongue and immediately posterior to the lingual surfaces of the maxillary and mandibular anterior teeth. This appliance prevents the individual from thrusting the tongue between the incisal edges of the maxillary and mandibular teeth. After a time the habit should be discontinued.

Prophylactic orthodontic principles are well served when the alert operator detects these or other pernicious oral habits and applies the simple therapy that can effect their discontinuance.

10. *Use space-maintaining devices following the premature loss of primary teeth whenever observation reveals a tendency for the space to close beyond safe limits.* If there is one single prophylactic technique that is potentially capable of doing more good than any other, it is that associated with preventing undesirable shifting of permanent teeth following premature loss of primary teeth. Quoting again the survey made by Brandhorst,[2] one-fourth of the controllable

malocclusion, in a group of 100,000 school children, had as its etiology the premature loss of primary teeth, and one-fifth of all the dentofacial and oral deformities observed were of this same origin.

An unbiased appraisal of the need of space-maintaining appliances, following the premature loss of primary teeth, would bring out the fact that mechanical space retention is not always a requisite because spaces may: (1) open, (2) close, (3) close initially, open later, or (4) remain the same.

In the practice of prophylactic orthodontics we are primarily concerned with the spaces that close. Prevention of space closure beyond safe limits can be managed by the use of space-maintaining appliances. According to Hartsook,[8] "safe limits" of space closure in the primary molar area are up to three-quarters of the mesiodistal width of the succeeding premolar tooth. We are more radical and would recommend mechanical space maintenance in the primary molar areas whenever the first permanent molars showed a tendency to move anteriorly more than 1.7 mm. in the mandibular arch or 0.9 mm. in the maxillary arch. According to Black's[9] tables of tooth sizes, the average combined mesiodistal width of the primary canines and molars exceeds that of succeeding canines and premolars by 1.7 mm. in the mandible, and 0.9 mm. in the maxillae. If these figures are properly interpreted we can understand why there normally is an anterior or mesial shift of the mandibular first permanent molar that averages 1.7 mm. and a similar shift of the maxillary first permanent molar that averages 0.9 mm. An anterior movement of the first permanent molars that is in excess of the difference between the combined widths of the crowns of the primary canines and molars and those of the permanent canines and premolars must be prevented if normal occlusion is to evolve.

Fig. 19.—A type of space maintainer designed by Wesoke.

We know that this is an arbitrary and unscientific method of determining the indication or contraindication for maintaining space when primary molars have been lost prematurely. If applied, it will surely result in the use of space maintainers in some cases where they are not needed, but in this matter, a few sins of commission would be less damaging to the dentofacial complex than the many sins of omission that are committed daily, the wages of which are dentofacial anomalies.

There are many types and varieties of space maintainers that may be used. The type of appliance that is used matters little; that one is used when indicated matters a great deal. Willett's[10] excellent appliances using cast overlays are

popular. Wesoke has suggested an appliance that uses chrome alloy wire embedded in amalgam restorations. This type of space maintainer may be used when the abutment teeth have proximal amalgam restorations that face the space to be retained (Fig. 19).

In an effort to assay the validity of the statement so often made in orthodontic literature that premature loss of primary teeth is an etiological factor of prime importance, the author undertook a survey. A group of fifty-one children who had one or more primary molars extracted prematurely were studied. The spaces created by extraction of the primary teeth were carefully measured over a period of time. The average length of observation was six and one-half months. The time interval between measurements varied from two weeks to seventy-eight weeks. A modified Boley millimeter gauge was used to take the spatial dimensions. When the measurements were made, a definite and precise technique was followed that could be exactly duplicated on subsequent occasions.

To reduce further the chance of error entering into the computations, all spatial recordings were made by one operator.

The results of the survey follow:

1.	Children examined with one or more prematurely extracted primary molars		51
2.	Spaces measured		93
	a. Maxillary arch	35	
	b. Mandibular arch	58	
3.	Primary teeth prematurely lost		142
	a. Maxillary teeth	57	
	b. Mandibular teeth	85	
4.	Spatial measurements taken		238
5.	Average measurements per child		4½+
6.	Average time between measurements in weeks		17
	a. Shortest interval	2 weeks	
	b. Longest interval	78 weeks	
7.	Average spatial loss per case (in mm.)		1.07
8.	Average spatial loss in maxillary arch (in mm.)		1.30
9.	Average spatial loss in mandibular arch (in mm.)		0.93
10.	Average period each child observed (in weeks)		27

In 31 of the 238 measurements taken, the spaces showed no closure. The width of the space increased in 15 cases, and remained the same in 16 cases. Expressed otherwise, 87 per cent of all spaces closed, 6.3 per cent opened, and 6.7 per cent remained the same.

The average spatial loss in the maxillary arch was 1.30 mm. The average spatial loss in the mandibular arch was 0.93 mm. If only those cases are considered that were under observation for a minimum of two months, the average spatial loss in the maxillary arch becomes 1.47 mm. and 1.0 mm. in the mandibular arch.

Although the number of cases observed is insufficient to prove it, we may postulate that the premature loss of a maxillary primary molar is more likely to cause malocclusion than is the premature loss of a mandibular primary molar. Perhaps another way of stating it would be to say that the maxillary first permanent molar, when given the opportunity, has a tendency to drift anteriorly earlier and to a greater extent than does the mandibular first permanent molar under similar conditions.

Our thesis that the premature loss of a maxillary primary molar is potentially more capable of causing malocclusion than the early loss of a mandibular primary molar gains support when we recall that there is less "leeway" in the maxillary than the mandibular arch. That is to say, the combined mesiodistal

width of the crowns of the maxillary canine and first and second primary molars exceeds that of their succeeding teeth less than do the comparable primary teeth in the mandibular arch exceed their succedaneous teeth. In effect, therefore, less anterior shifting of the maxillary first permanent molars is needed to produce a dentofacial abnormality than of the mandibular first permanent molars.

Another interesting aspect of this survey developed when the cases were examined to determine what percentage of the spaces had closed within, and what percentage beyond "safe limits." Here, as previously, we arbitrarily used Black's[9] tables of the average widths of primary and permanent teeth to determine the safe limits of first molar shifting. In this computation, only those spaces that had been observed for a period of three months or longer were included. In the maxillary arch 27 such spaces were found; in the mandibular arch, 40. In the maxillary arch 20 spaces, representing 74 per cent of the group, closed beyond safe limits; 7 spaces, representing 26 per cent, remained within safe limits. In the mandibular arch 12 spaces, or 30 per cent of the group, diminished beyond safe limits, while 28 spaces, or 70 per cent of the group, stayed within safe limits.

SUMMARY

The incidence of oral and dentofacial anomalies among school age children of this country is high enough to make it apparent that a nationwide program of correction, though needed, is for the present impossible.

In recognition of this fact, a more widespread application of preventive orthodontic procedures is recommended. This would enlist the services of every general practitioner of dentistry in this country.

To furnish an effective prophylactic orthodontic service, the dentist must first give a careful examination. The following recommendations are made to expedite the examination:

1. Examine the occlusion.
2. Count the teeth present in the maxillary and mandibular arches.
3. Take at least five Bitewing films of every child patient.
4. Learn to appreciate the fact that certain natural adjustments take place in the positions and relations that some teeth assume at the time of their eruption, compared to the positions and relations in which they are eventually established.
5. Take impressions and make casts of the teeth whenever there is question of the manner in which occlusion is developing.

The second step in a prophylactic orthodontic program is the administration of indicated treatment procedures. A list follows:

1. Exercise great care in restoring the occlusal and proximal aspects of the primary and permanent teeth.
2. Extract primary teeth at the correct time.
3. Trim the primary molars when necessary.
4. Where indicated use tongue-depressor blades for correcting incisor crossbites.
5. Use brass ligature separating wire to release permanent posterior teeth from impacted positions.
6. Carefully consider the probable results of extracting primary or permanent teeth before recommending their removal.

7. Extract supernumerary teeth whenever and wherever found.

8. Surgically expose the crowns of those permanent teeth that are retarded in their eruption.

9. Break oral habits at the earliest possible time.

10. Use space-maintaining devices following the premature loss of primary teeth when observation shows a tendency for the space to close beyond "safe limits."

A survey conducted by the author suggests that maxillary first permanent molars move anteriorly, following the premature loss of adjacent primary molars, earlier and to a greater extent than do mandibular first permanent molars. Since there is less "leeway" in the maxillary arch, this would further suggest that the premature loss of a maxillary primary molar is more likely to be attended by complications in the dentofacial complex than is the premature loss of a mandibular primary molar.

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THE PASSAGE OF A PATIENT THROUGH AN ORTHODONTIST'S OFFICE WITH ATTENTION TO THE LABIOLINGUAL TECHNIQUE, EMPHASIZING THE OLIVER GUIDE PLANE

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ONE of the greatest factors in the operation of a successful orthodontic practice is a definite over-all plan wherein the orthodontist runs the office instead of the office and the patients running him. A definite plan permits one to see more patients and do a better service. This, with a definite plan of treatment for each case before treatment is instituted, will bring happiness to an orthodontist that he can find in no other way.

Evidence of lost motion and waste of time should and does cause patients to lose respect and confidence in any office. Many years ago I realized that little could be done in the way of orthodontic service by telephone; therefore I have trained personnel in my office who have helped me to educate that portion of the public who seek my services that it is a waste of everyone's time to go through long discussions until casts and complete x-ray examinations are made. When these, and as much information as the patient and family can give in regard to the history of the patient's health, are on hand, I then have consultation in my private office with the patient or the patient's parents, depending upon the circumstances. At this time the patient is free to ask any questions he wishes, and if this occasion is handled properly it will save a lot of headaches later for all concerned. There should be no compromise in obtaining a thorough physical examination from a competent physician from the standpoint of general health.

Many of us are too eager to place mechanical appliances without first determining in so far as possible what the outcome of treatment will be. For sixteen years I have conducted an orthodontic practice in Nassau, one of the Bahama Islands. During the war, restrictions and other difficulties prevented my seeing those patients for months at a time, and I believe it would do a lot of good for every orthodontist to have such a practice. I could never overlook the fact that children grow, and often in a more satisfactory way without extensive mechanical interference.

I am going to present two cases which I think might help a few of you who have not been in practice as long as I have or had time to make as many mistakes. Except for my friendship and close association with Dr. C. C. Howard for nearly thirty years, I am sure I would have used a more strenuous procedure of treatment than I used on the cases I will show. I would have used a more

Presented at the Forty-fourth Annual Meeting of the American Association of Orthodontists, Columbus, Ohio, April 26-29, 1948.

Fig. 1, *B*.

Fig. 1, *A*.

Fig. 2, *A*.

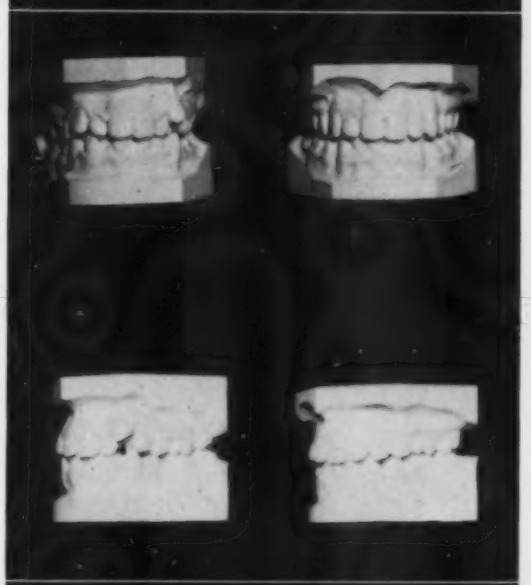

Fig. 2, *B*.

Fig. 3, *B*.

Fig. 3, *A*.

Fig. 1.—Case 1. *A*, Before treatment, *B*, With lingual appliances used in treatment.
Fig. 2.—Case 1. *A*, Before treatment. *B*, After treatment.
Fig. 3.—Case 1. *A*, Left, before treatment. *B*, Left, after space closure with lingual appliances.

strenuous procedure too if it had not been for an experience I had about fifteen years ago, in which I removed the four first premolars for a boy and did not put appliances in right away. The patient failed to come back as instructed, and when he did I came near having to put first molars against four cuspids because the spaces had completely closed and the teeth were still very crowded.

In the first case shown here (Figs. 1-4), the main treatment used was two lingual appliances as shown. For a short time we used plain labial appliances on the upper and lower teeth to assist in aligning the anterior teeth. I have no quarrel with those of you who have been banding these cuspids and all the other teeth in these cases, but, truthfully, the only way you could prevent most of these cuspids from moving distally would be to band them. If you will follow this procedure, you will be astounded on seeing how anxious nature is to come to your aid. This patient was treated in such a way that it was never necessary for anyone to see appliances in place and, as indicated, the patient is very pleased with the end result. I do not believe there is a safer, better approach than ours to problems of this type. I have used this approach for a long time, and if anterior bands are needed at the end of treatment, of course, we use them. I assure you there will be little root resorption brought about by this conservative approach.

Fig. 4.—Case 1. Patient three years after retention removed.

In presenting the next case (Figs. 5-8) I would like to use the title "Give them a chin." For a number of years I was not convinced that the guide plane, an appliance originated by Dr. Oren A. Oliver of Nashville, Tennessee, was as effective in certain cases as it is. For the last two years, especially, I have devoted much time to the study and use of this appliance. I found beyond any doubt that distoclusion cases similar to the one I am going to show cannot be corrected as well by any method as by the proper use of the guide plane. With all due respect to those who have developed mechanical devices to aid in orthodontic treatment, I am going to ask your indulgence for a few minutes in the study of the changes which take place when the guide plane is employed. Please do not confuse the guide plane with any other appliance such as bite plane. This

appliance must be constructed properly or it is ineffective. Once you understand the principle of this appliance, it will be easy and a source of great satisfaction. On your program you will note clinics by Dr. Bowyer, Dr. Tarpley, Dr. Terry, and Dr. Bill Oliver demonstrating construction and indications for this appliance.

Fig. 5, *B*.

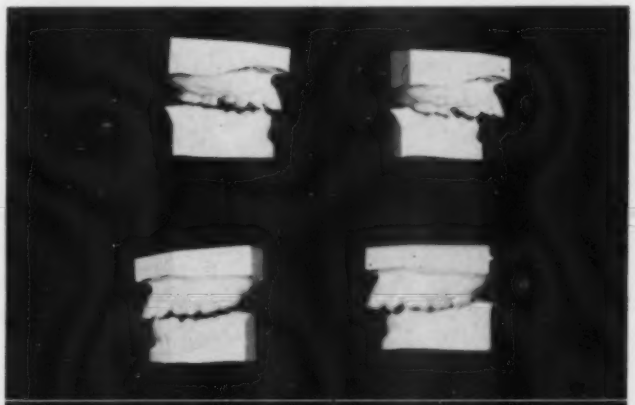

Fig. 5, *A*.

Fig. 6, *A*.

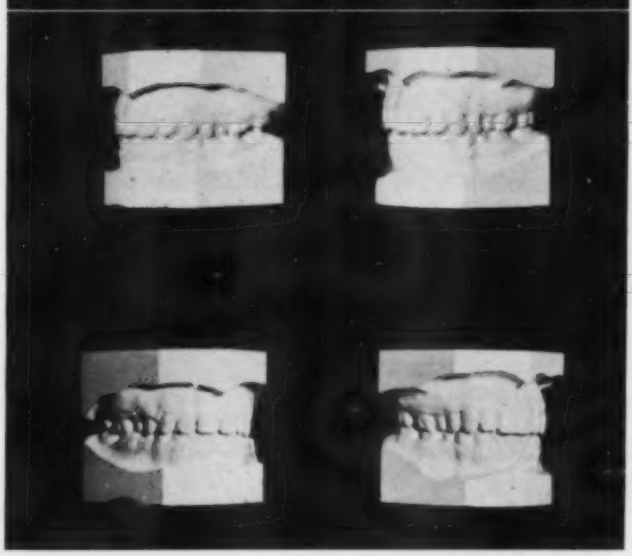

Fig. 6, *B*.

Fig. 5.—Case 2. *A*, Before treatment. *B*, Position desired by use of Oliver guide plane.
Fig. 6.—Case 2. *A*, At the time of removing appliances. *B*, Five years after removing appliances.

I made up my mind some time ago that I was going to learn something about what took place with all the tissues involved during the use of the guide plane. We know that when we place the body of the mandible forward with this appliance, plus the use of elastic bands, we bring about so much stress and strain upon the tissues involved that the head of the condyle finds its way back to its original position in such a way as to allow the anterior border of the mandible to remain where we placed it with relation to the cranium. When the bite is opened and none of the posterior teeth are in occlusion, all you need to do is remember what happens to teeth when the teeth occluding with them are removed. When these posterior teeth make further appearance in the oral

cavity and have come into contact with their opposing members, we put the patient on biting exercises, still using the guide plane. When the patient can no longer bite distally to the position we have created by the guide plane, we have felt that we then knew we had given the patient a chin in many cases where no other appliance would suffice. The changes take place in the neck of the condyle, the ascending ramus, the body of the mandible, and in the glenoid fossa itself. The important muscles which aid in this procedure are the temporalis, masseter, temporomandibular ligament, and external and internal pterygoid.

Fig. 7.—Case 2. Left temporomandibular joint five years after treatment.

Fig. 8.—Case 2. Right temporomandibular joint five years after treatment.

In this procedure you move the entire mandible forward without moving the teeth off the basal bone where nature intended them to be. To corroborate our contention I will quote Wolff's law:

> Every change in the form and function of the bones or of their function alone is followed by certain definite changes in their internal architecture, and equally definite secondary alterations of their external conformation, in accordance with mathematical laws.

By setting the mandible forward, opening the bite, we definitely change the function of the parts involved. This is followed by the changes in the neck of the condyle, the head of the condyle, the ascending ramus, the body of the mandible, and the glenoid fossa itself in the establishment of normal relationship of the temporomandibular joint. By the same token and by the same law, I contend that by the use of nearly all other appliances where elastics are depended upon to move the lower teeth forward regardless of how they are tied together in a unit, we many times move the teeth off the ridge, causing in the final analysis overlapping of the anterior teeth by virtue of the fact that the tissues enveloping the roots of the teeth lend themselves to pressure and strain more readily than does the mandible itself. I am aware of the controversial question of bone growth and changes, but my purpose will be accomplished if greater study is done by our group.

I certainly do not present this as the answer to the orthodontist's prayer, but I hope more of you men will really study this and see for yourselves just what happens. We have just recently x-rayed a number of patients we have so treated and find that the condyle is in normal position when the teeth are in occlusion and the anterior border of the mandible is forward where we placed it with the guide plane. We are at this time making a complete record of these cases; we start by x-raying the temporomandibular joint before the appliance is placed and immediately after its use is instituted. We are seeing results that are most gratifying. We will continue to accumulate data on this phase of orthodontic treatment, collaborating with two orthopedic specialists.

I am in a tourist city where my friends send every type of case on earth for us to care for during their vacation. For my two partners, Dr. Terry and Dr. Clark, and me, time has meant little lately because we find ourselves at the office later hours than ever. We are spending time studying all types of orthodontic approaches in order that we may intelligently select the type of appliance best adapted to certain cases. To those of you who are young in the profession, I advise you not to close your eyes to further developments in dealing with our problems.

The door to a vast reservoir of scientific knowledge has been opened by men like Dr. Milo Hellman, Dr. C. C. Howard, and many others. Therefore it is our duty to keep that door open forever.

2742 Biscayne Boulevard.

Just before going to press, news was received of the death of Dr. William H. Pearson, pioneer orthodontist, of Norfolk, Virginia.

Editorial

Honors to Bernard G. deVries

Dr. Bernard G. deVries, of Minneapolis, Minn., retired as president of the American Board of Orthodontics at the conclusion of its last session, April 29, 1949. He was succeeded in that position of trust and honor by Dr. James D. McCoy of Beverly Hills, California.

Both of these directors have been outstanding, not only for what their work has achieved for the Board in maintaining the highest requirements, but they also hold the records for the greatest number of years of service of any of the twenty-three directors, including the original group. As members of the Board they were not only elected for the full seven-year period, but have also served appointments to complete the unexpired terms of other directors.

Dr. deVries's service as a director covered a period of twelve annual sessions of the Board, plus the intervening war years when much work had to be done by him as secretary. In recognition of his efficient and tireless contributions, the American Board of Orthodontics saw fit to pay formal tribute to Dr. deVries with the following resolution:

> Upon the retirement of its President, Bernard G. deVries, from the American Board of Orthodontics after a service covering a period of twelve years, seven of which were performed in the arduous duties of Secretary, and in recognition of his efficiency and enthusiasm, does this Board place itself on record for its own satisfaction and the reference to future Boards that Dr. deVries service to the Board, the American Association of Orthodontists and its members, has been one of the most outstanding of any director in the history of the Board.

It was felt by the present Board that this would not only be unanimous with all the fifteen directors with whom he has served, as well as with his surviving predecessors, but would establish a pattern of high ideals toward which all future directors should aspire.

In further recognition of his distinguished career in advancing orthodontics as a specialty and a science, as well as his established leadership, the Nominating Committee of the American Association of Orthodontists recommended him for president-elect of that body for 1952, and he was unanimously selected without opposition.

Thus, as a reward for the fidelity with which he has discharged a trust and a responsibility has Dr. deVries been promoted to the highest honor, that of president-elect of the American Association for 1952. After this brief respite it will be good to see Dr. deVries back in action again, and it is certain that his zeal will kindle the enthusiasm of others and a great meeting will be assured.

As a lover of trails and streams Dr. deVries has found time to hang up some exceptional records as a sportsman and big game hunter—one of those fellows who puts a lot behind anything he undertakes. As a true pioneer, his record is strictly unselfish and unobtrusive, and as such he has put much behind the march of orthodontics toward its recognition as the public service which it has so richly attained.

J. D. E.

Department of Orthodontic Abstracts and Reviews

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The Physiology and Mechanics of Swallowing and Their Clinical Significance. By Arnold A. Nove, *D. Record* **68**: 28-33, February, 1948.

Clinical observation, over a period of years, of the mechanism of swallowing has revealed that:

a. There is a physiologically ideal act of swallowing *concurrent with which there is a maximum postnasal drainage.*

b. There is an adapted type of swallowing which *tends to inhibit postnasal drainage.*

Each of these presents a clinically discernible behavior pattern.

Nature in its effort at economy has evolved the breathing mechanism to be integrated with that of swallowing. The act of deglutition appears to have to perform reflexly: (a) a momentary inhibition of respiration, (b) stimulation of the ciliary mucosa of the nasal cavities, paranasal sinuses, and pharyngotympanic tubes. This important nexus in physiologic function of the swallowing reflex probably constitutes a major factor in insuring a healthy postnasal and paranasal mucosa, thus controlling and maintaining the functional integrity of the whole of the respiratory mechanism.

In the structurally normal. i.e., an ideally integrated cervicofacial component, when a bolus of food has reached the retroglossal area, a little "sauceboat"-shaped trough is formed, with the tip of the tongue resting against the lingual surface of the upper teeth. The soft palate and its arches cover the postnasal openings and tympanic orifices respectively, the pharynx rising at the same time; a suprapharyngeal palatine fold is formed; the tongue and associated structures, being bound to the pharynx and thus elevated, cause the orifice of the larynx to abut against the epiglottis and the mouth of the esophagus to face the posterior end of the bolus. The physicochemical effect of this triggerlike contact, via the taste buds and possibly olfactory nerves, brings about a glossopharyngeal reflex, initiating a chain of synaptic transmissions affecting the total innervation of the head and neck. This mass discharge of nervous energy (summation), produced by contact between the bolus and the esophageal opening, induces muscular contraction, culminating in a sphincteric action of the latter and the engulfing of the bolus (the obverse of the action of the anal sphincter). The relaxation which follows this contraction of the total musculature involved results in a partial vacuum, in the release of which the soft palate and the arches act as a valve.

The pumping action consequent upon the release of this vacuum stimulates ciliary action and maintains a positive drainage of the postnasal and paranasal mucosa, as well as the Eustachian tubes, thereby contributing mterially to optimum function of the respiratory mechanism. Liquids, saliva, and mucus would obviously be swallowed in the same manner in response to excitement of the existing conditioned reflex.

This hypothesis of the mechanism of swallowing is based on the following considerations:

The levatores palatini cause the soft palate and uvula to curl up and cover the postnasal space, and the tongue, supported by the stylohyoid, styloglossus,

and stylopharyngeal ligaments and muscles, rises carrying the larynx and the esophagus. As these are bound up with the pharynx, the latter rises synchronously and is accommodated in the cone-shaped postnasal space, *buckling up the oropharynx.*

The mouth of the esophagus has a circular band of muscles, and this suggests a sphincteric action of engulfing (the obverse of the anal sphincter function), rather than food being "forced" into the esophagus.

In children, the sagittal outline of the posterior palatine area in the normal is horizontal. In the nonnormal, the posterior palatine plane tends to have a *downward* bend presenting a concave appearance, and it would seem that this is produced by a downward approximation of structural units preparatory to the act of swallowing consequent upon and imposed by faulty integration of the structures concerned.

In the normal (functionally ideal), the hypothetic internal functioning expresses itself *externally* in one synergic reflex action encompassing a closing up of the orbicularis oris, an upward lift of the hyoid and the trachea in a forward direction, accompanied by a reverberatory movement in the sternomastoid area, ending in a contraction followed by relaxation.

This effortless synergy of action can take place only when all the structural units connected with mastication, deglutition, and respiration are faultlessly integrated, that is, when the skeletal framework of the "masticatory face" is fully developed and the maxillae are in correct relationship. When at physiologic rest all the musculature concerned (reciprocal antagonists) remains in a state of equilibrium with the mandible and the hyoid bone forming a fulcrum or privotal center. It is significant that the center of the functional nerve components controlling this triumvirate function is situated in the medulla oblongata (the nucleus tractus solitarius portion), which constitutes the central station whence visceral and somatic function is controlled.

When the jaws are incorrectly apposed medially, anteroposteriorly, or vertically, this indispensable pivot or fulcrum for normality is out of true, and all the structural units concerned with mastication, deglutition, and respiration are compelled to function by means of adaptation. This function of *adaptation* expresses itself *externally in a series of predeglutitionary movements,* chiefly noticeable in the orbicularis oris and in the hyoid regions, by a forward thrust of the mandible and/or a lateral flexion of the neck, or a forward and upward thrust of the neck, followed by a feeble *downward* movement in the hyoid region and weak action of the neck muscles prior to relaxation, and it represents more of a sucking action. Another variant may be the presence of a splashing or gulping sound. A state of tonus is lacking during the period of physiologic rest: there is a tendency to muscular agitation expressed in a variety of ways, because the bony "scaffolding" requisite for the reciprocal antagonists is deficient in size or faulty in shape. Occasional relief by sandwiching the tongue between the upper and lower jaws is discernible and is a poor substitute for the normal fulcrum. Such a muscular behavior pattern, indicating some modified form of positioning and approximation of the structures concerned prior to the swallowing reflex taking place, may reduce the nerve potential of the postnasal suction power.

Assumption of the foregoing observations regarding the behavior pattern in the functional interplay between the swallowing and breathing mechanism and the corollary ciliary function makes it clear why the various clinical phenomena relating the pathologic conditions of the respiratory system are associated with malformed and malrelated bony structures of the head and neck, for in consequence thereof the coadaptation for momentary close approximation of the structures referred to is delayed, or does not take place fully, and the ciliary drainage may be inhibited. Some biochemical changes, as yet unknown

(antigens?) may take place which would *condition* the mucosa adversely, rendering it *pathologic or allergic*. This may explain the reason why a certain percentage of cases after being operated on for tonsils and adenoids continue to suffer, or even begin to suffer, from hay fever or asthma, for it is possible that the inadequate postnasal drainage due to a faulty method of swallowing, imposed on such cases initially by the bulky diseased lymphoid tissues, has left them with a conditioned inhibitory reflex which maintains a faulty coadaptation of the structures involved in swallowing, while at the same time they have been deprived of some vestige of a defensive mechanism which may have been there. Even the slightest disturbance of balance in the corrected intermaxillary relationship, such as is produced by the cusp of an erupting tooth impinging on the splint worn for the purpose of maintaining such relationship, may reverse an already favorably established condition. Similarly, in a certain percentage of cases where one may fail to continue to correlate the jaws for ideal reflex functional physiologic requirements, the process of "rehabilitation" is reversed until one has succeeded in correcting it by a favorable jaw orientation.

The need for constant vigilance regarding the pattern of swallowing is manifest, even though one may be satisfied that the reduction of structural imbalance has been achieved, lest an inhibitory "hangover" may under certain conditions reassert itself and reverse an established favorable process.

Instead of regarding malocclusion as a separate and distinct clinical entity, the orthodontist has to view the problem as a sign of a general skeletal disharmony and of significance to the whole economy of the growing child. Such an approach would be in full accord with the current trend in medicine.

The disposition in some orthodontic circles to consider too literally the etiological factor of malocclusion from the standpoint of man's phylogenetic history, thus adopting a fatalistic attitude toward the problem by resorting to so-called judicious extraction of dental units in order to conform dental material to the bony facial structures, is manifestly wrong. On a mere nodding acquaintance with heredity, to seal complacently the fate of the child's developmental growth pattern of the facial bony framework by the removal of dental units is merely coquetting with genetics. A child cannot be regarded otherwise than as a human organism which is in a constant state of growth and development. Whatever clinical problem it may offer, it represents both a clinical entity of a genetic form in retrospect and at the same time a mass of ontogenetic potentialities in prospect. We must learn how to explore to the fullest extent this latency of developmental powers intrinsic in every child, and how best to cater for it.

Tomorrows Food, the Coming Revolution in Nutrition. By James Rorty and N. Philip Norman, M.D., with foreword by Stuart Chase. New York, Prentice Hall, Inc., 1948. $3.50.

This is a well-worth-while book for all interested in producing their own foods or in nutrition. This book is written by a crusading journalist and by an expert in nutrition—a combination to insure easy reading. It gives a history of soil culture and its various schools of thought, an interesting eulogy of Harvey W. Wiley, a résumé of the studies of a dentist, Weston A. Price, an analysis of the co-ops, their values and failures and how they might be extended to health services, the story of margerine, butter, and sugar propaganda, a list of processed foods, a list of natural foods, and lessons to be derived from the draft rejections. The book has to be read to be appreciated. There is food for thought as well as for internal nutrition.

George S. Callaway.

News and Notes

Central Section of the American Association of Orthodontists

The regular annual meeting of the Central Section of the American Association of Orthodontists will be held Sept. 25, 26, and 27, 1949, at the Sheraton Hotel, St. Louis, Missouri.

EARL E. SHEPARD, Secretary, Lister Building, St. Louis, Missouri.

Northeastern Society of Orthodontists

The fall meeting of the Northeastern Society of Orthodontists will be held on Nov. 28 and 29, 1949, at the Hotel Commodore, New York.

Southern Society of Orthodontists

The twenty-fifth annual meeting of the Southern Society of Orthodontists will be held at the Roosevelt Hotel in New Orleans, Louisiana, from Sunday, Oct. 30, 1949, through Tuesday, Nov. 1, 1949.

American Academy of Pedodontics

The meeting of the American Academy of Pedodontics will be held Oct. 14 to 15, 1949, in San Francisco. Address inquiries to Elsie C. Schildwachter, Secretary, 6831 Seville Avenue, Huntington Park, California.

Sixth Annual Dental Medicine Seminar

The complete program for the Sixth Annual Dental Medicine Seminar in Palm Springs, California, October 23 to 28, has been announced by Hermann Becks, M.D., D.D.S., of San Francisco, Seminar president.

A panel of seven leading medical men will make up the faculty of the seminar, which is devoted to improving understanding of the fields bordering dentistry and medicine.

Faculty members and their lecture schedules are as follows:

Francis A. Arnold, Jr., B.S., D.D.S., Senior Dental Surgeon, United States Public Health Service. Recently appointed assistant director of the National Institute of Dental Research, he has conducted studies on the bacteriology and epidemiology of dental caries with special emphasis on the fluoride relationship to the problem. His lectures, scheduled at 10:20 and 11:15 A.M., October 25, will be: "The Present Status of Dental Caries Control by Fluoridation of Drinking Water and the Control of Dental Caries by Topically Applied Fluorides and Other Methods," and "A Discussion of the Mechanism of the Effect of Fluorides on Dental Caries Etiology."

D. Harold Copp, M.D., Ph.D., Associate Professor of Physiology at the University of California. His research work includes studies of medical uses of radioactive isotopes and of bone metabolism. Dr. Copp will speak at 9 P.M., October 24, on "Implications of Atomic Energy in Medicine and Dentistry," and at 8:30 A.M., October 26, on "Recent Developments in the Metabolism of Bones and Teeth."

Arthur C. Curtis, B.S., M.D., Professor and Director of the Department of Dermatology and Syphilology at the University of Michigan. He will speak at 8:30 and 9:30 A.M., October 24, on "Clinical Diagnosis of Dermatological Lesions of the Face and Oral Cavity," and "Diseases of the Hands and Nails."

Seymour M. Farber, M.D., Assistant Clinical Professor of Medicine, University of California Medical School and in charge of the University Dental College's course in Internal Medicine. He recently has completed research on treatment of tuberculosis and diagnosis of cancer of the lung. His lectures, at 8:30 and 9:30 A.M., October 25, will be: "Contagious Chest Diseases—A Problem in the Practice of Dentistry," and "Recent Advances in Diagnosis and Treatment of Diseases of the Chest."

Wilton Marion Krogman, Ph.B., M.A., Ph.D., Professor of Physical Anthropology, Graduate School of Medicine, University of Pennsylvania, and President of the American Association of Physical Anthropologists. His lectures will be: 10:15 A.M., October 24, "The Growth of the Whole Child in Relation to Dental Problems"; 11:15 A.M., October 24, "The Assessment of the Degree of 'Deviation' from the Normal in Face and Teeth"; 9 P.M., October 26, "The Case of the Talking Skeletons."

Balint Orban, M.D., D.D.S., Director of Research, Colorado Dental Foundation, Colorado Springs. The author of several textbooks, Dr. Orban will speak at 10:20 and 11:15 A.M., October 26, on "Classification and Systemic Aspects of Periodontal Diseases" and "Tissue Changes Due to Occlusal Trauma."

Paul Popenoe, Sc.D., Director of the American Institute of Family Relations. One of last year's most popular speakers, Dr. Popenoe will discuss "Analysis of Personality Traits" at the 9 P.M. seminar session on October 25.

Orthodontic Offices

Offices in Dallas, Texas, built entirely for the practice of orthodontics are occupied by Dr. Brooks Bell, Dr. Joe Favors, and Dr. Frank Roark.

The building employs insulating glass in all window openings to lighten the load of the air conditioning plant in maintaining even temperatures; it is a two-story structure having stone facing on the street side, and side walls of brick and hollow tile. The building is erected on a concrete slab which houses all copper pipes for air, water, gas, and electricity. All partitions are movable.

Orthodontics building in Dallas glazed with insulating glass to lighten load of air conditioning system.

Both north and south window walls in the reception room are of Thermopane, an insulating glass. In addition, the large glass areas provide abundant daylight for reading and lend an out-of-doors atmosphere to the room. The reception desk is built to house files, typewriter, and intercommunication control board.

There is also a parking space of 3,200 square feet.

Notes of Interest

Rolland C. Billeter, D.D.S., announces the opening of offices at 504 Post Building, Battle Creek, Michigan, practice limited to orthodontics.

Dr. John W. Richmond announces the removal of his office to Suite 493, New Brotherhood Building, Kansas City, Kansas, practice limited to orthodontics, telephone DRexel 5232.

Robert E. Ross, D.D.S., M.S., announces the opening of his office at 15819 Wyoming Avenue, Detroit 21, Michigan, phone Un 4-8584, practice limited to orthodontics.

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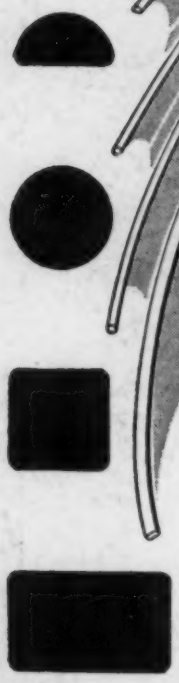

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